Playing posthumanism

A study of machine vision and tensions of human-machine relations in digital games

Ragnhild Solberg

Thesis for the degree of Philosophiae Doctor (PhD)
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Scientific environment

I carried out my dissertation research between 2019 and 2022 within the Department of Linguistic, Literary, and Aesthetic Studies (LLE) at the Humanities Faculty at the University of Bergen, Norway. At the University of Bergen, I was part of the Digital Culture Research Group led by Professor Astrid Ensslin and Professor Jill Walker Rettberg, the Network for Games Research led by Professor Kristine Jørgensen, and the Bergen Electronic Literature Research Group led by Professor Scott Rettberg.

A planned research stay abroad was cancelled due to COVID-19 restrictions but led to the opportunity to be a remote-attending visiting scholar at the Digitalization and Robotization of Society Research Group led by Associate Professor Kristine Ask and Dr. Roger Andre Søraa at the Norwegian University of Science and Technology (NTNU) in Trondheim, Norway, in the spring semester of 2021.

The present PhD study was initiated and conducted within the interdisciplinary project *Machine Vision in Everyday Life: Playful Interactions with Visual Technologies in Digital Art, Games, Narratives and Social Media* led by Professor Jill Walker Rettberg. My research is supported by the Machine Vision in Everyday Life project, which has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation program (Grant Agreement No. 771800).

Preface and acknowledgements

When I was a kid, I thought that the Zerg would come to northern Norway and hunt me down – or make me their queen, whichever was most convenient for them. Although I've not (yet) been selected as the next Kerrigan, I've always believed in the possibilities of the fictional realities of games. I remember well the feeling of collaboration when I was one of forty people around the world whose player character ran around in circles to practice the final boss of Ahn'Qiraj in its antechamber. I saw clearly how the cognitive gears were turning when the Narrator announces to go through the left door, but my students were faced with two doors. The pure joy bundled with confusion of experiencing a game for the first time was nowhere more evident than when my grandma rocked it out on a plastic guitar. Through representation, online gaming, and everyday conversations, I've also experienced entrenched prejudices in games and game cultures. But I continue to marvel at the sometimes utterly boring, sometimes magical experiences that allow insight into stories and perspectives I couldn't possibly have imagined on my own. Where else can "……..." convey so much emotion? And all of a sudden, fixing a space station and accusing your friends of lying while guffawing through the microphone is a Friday night in a pandemic lockdown.

Being a gamer whose job is to analyze games is a bit of a dream come true. It's also immensely challenging, and I can add to the list above that researching games is hard work. Neither the games nor the work is simply clear-cut, so any attempt to convey the results of several years' worth of hard work probably won't be either. Perhaps it helps the reader to conceptualize my dissertation somewhat like J.R.R. Tolkien's Entish, in that "it takes a very long time to say anything in it, because we do not say anything in it, unless it is worth taking a long time to say, and to listen to." (2004/1954, 465, book 3 ch 4). Indeed, both Entish and this dissertation might seem airy, somewhat stubborn, and make you crave multiple cups of coffee, but it'll hopefully be evident that there's a story behind them. In the case of my dissertation, it's a story about our interactions with games; about how to (re)conceptualize human

and machine agents in this meeting; about the strange experience of being in-between. A story that takes a long time to narrate, but that's worth to listen to.

Stories such as this aren't created in vacuums; they're results of collaborative creative processes. Now, it's no secret that this dissertation was written on hard mode during a global pandemic and that much of the work was done from a government mandated home office. Therefore, the list of culprits isn't very long, but I'd argue it's even more valued.

First, thank you to my two supervisors, Jill Walker Rettberg and Brendan Keogh, for guiding me through this strange choose-your-own-adventure experience. Thank you, Jill, for this opportunity. Thank you for the collaboration over these years and your unrelenting enthusiasm for whatever strange ideas I propose. And, thank you for referring to me and the other PhD students as experts in our fields from the very first day. Thank you, Brendan, for keeping me grounded in the games when I struggled to find the balance between the overall project and my part of it. Thank you for providing thought-provoking feedback throughout this process – and for opening that first email titled "Would you kindly?" even though you probably know I don't know mind control.

To the Machine Vision team – Linda Kronman, Marianne Gunderson, Gabriele de Seta, Stein-Magne Bjørklund, Linn Heidi Stokkedal – thank you for the discussions, the swimming, and the couch co-op gaming sessions; there's always an available spot for you next to me when I play.

To the generous people at DigiKult at NTNU, who kindly took in my virtual representation when physical travel was off the table, thank you for inspiring discussions.

To Daniel Vella and Kristine Jørgensen, thank you for reading and commenting on this manuscript in the masterclass (final reading) and midway reading, respectively. Your insightful feedback made me realize that the things I avoid writing about are

central to my dissertation. To Hannah Ackermans, for reading and helping me make sure that the text is legible for all audiences.

To my fellow PhD travelers and colleagues – Tobias, Ea, Gunhild, Maiken, the 309 Lunch Club (and its digital version) – thank you for wasting your valuable time with weaving in and out of dissertation talk, serious talk, and not even remotely serious talk.

To those who open or download this dissertation with no intention of actually reading it but still want to show their support by saying they did; family, extended family, and friends, thank you for your continued support. A special thanks to my siblings for being the most formative online and offline gaming partners, and to my parents for always asking "how did it go?" when I came for dinner from WoW raids in my childhood, even if I was late because I couldn't save and they didn't really understand what I was doing anyway. Ingeborg, Eirik, mamma, pappa – thank you for your unwavering encouragement to play, in all aspects of life.

To the indispensable non-human agents; to digital games and board games, to chocolate and caffeine, to really bad fantasy literature at 1 am, to sunshine and first-snow-pastries.

Finally, to my human and more-than-human companions, without whom this endeavor would've been a lot harder, in part because Excel is a complete mystery until the only other person in lockdown home office turns around to help, but also because they're objectively amazing. Håvard and Pixel, a ginormous thank you for being you – and for showing me there's an offline as well.

Ragnhild S. Solberg

Trondheim, 07.22.2022

Abstract

This article-based dissertation investigates the role of machine vision technologies in digital games and their relations to other agents. Machine vision in games can be depicted on a diegetic level and is enacted by the game. This double-orientedness provides an opportunity to study the relation between machine vision and other agents, within and beyond virtual environments. The study applies a mixed methods digital humanities approach to answer the main research question: *What characterizes machine vision in games, and how are human-machine relations explored through machine vision in games?*

Existing research on human-machine relations in games show the need for decentering player hegemony to acknowledge the interrelational and cyborgian experience of playing games. This dissertation addresses how games negotiate the cyborgian play experience with the power fantasies that often accompanies this experience. In other words, the dissertation demonstrates how machine vision in games can simultaneously reify and challenge dominant ideologies of human-machine relations. Supported by rich empirical data from creating a database on machine vision representations in 77 games and textual analyses of selected titles, the dissertation provides an in-depth view of how game assemblages are dynamic constellations that can hold both posthuman and transhuman experiences in the fiction of the game and in the player-and-game relationship. Four independent articles explore these aspects of machine vision:

The first article of this dissertation documents the interdisciplinary development of a database and dataset of how machine vision technologies are imagined in games, digital art, and narratives. The article contributes with the dataset and methodological discussions on mixed methods research in the humanities. The findings from the first article provides the material for in-depth textual analyses in subsequent articles.

The second article examines the functions of holograms in 24 digital games. Through a close reading of *Horizon Zero Dawn* (Guerrilla Games 2017), the article demonstrates that binary conceptualizations of presence and agency are challenged

with game holograms, both in the diegetic environment and mirrored between player and game. The findings contribute to an understanding of humans and machines as connected through agency in posthuman assemblages.

The third article investigates how embodiment and agency are impacted by the camera as metaphor and as interface in digital games. Building on diegetic camera representations in 41 titles and in-depth analyses of *Final Fantasy VII Remake* (Square Enix 2020) and *Watch Dogs: Legion* (Ubisoft Toronto 2020), the article contributes with the concept of "cyborg vision" to reinstate the body when vision is presented as disembodied.

The fourth article shows how the ideal of the partial perspectives of cyborgs is constantly challenged by depictions of mastery in games with machine vision. To demonstrate the connection between machine vision and militarized vision of domination, the article performs textual analyses of visual filters beyond the human spectrum in *Call of Duty 4: Modern Warfare* (Infinity Ward 2007) and *Cyberpunk 2077* (CD Projekt Red 2020). The analyses identify that distributed agency both enables and complicates fantasies of dominance in games.

Combined, the articles demonstrate that machine vision in games is always mediated, partial, and embodied, but hidden behind and complicit in narratives of domination. This tension between partial, embodied agents and totalitarian, disembodied agents is how games present human-machine relations. The tensions of embodiment and agency that arise are used to develop a theorization of games as fundamentally distributed and situated phenomena through the understanding of being-in-the-assemblage. The dissertation contributes to game studies criticism on anthropocentrism and to the growing body of work examining games from posthuman and feminist perspectives. The study also draws on scholarly fields such as media studies, surveillance studies, and philosophy of technology to explore these relations.

Sammendrag

Denne artikkelbaserte avhandlingen utforsker maskinsynteknologiers rolle i dataspill og deres relasjoner til andre agenter. Maskinsyn i spill medieres dobbelt: i fiksjonen på et diegetisk nivå og i møtet mellom spiller og spill. Denne doble medieringen gir muligheten til å studere relasjoner mellom maskinsyn og andre agenter både innenfor og utenfor spillverdener. Studien bruker en metodetriangulert digital humaniora-tilnærming for å svare på forskningsspørsmålet: *Hva kjennetegner maskinsyn i spill og hvordan utforskes menneske-maskin-relasjoner gjennom maskinsyn i spill?*

Eksisterende forskning på menneske-maskin-relasjoner i spill viser nødvendigheten av å desentrere spillerens hegemoni for å anerkjenne samhandling mellom maskin og spiller. Denne avhandlingen addresserer hvordan spill forhandler mellom en «kyborgsk» opplevelse av å spille spill og maktfantasiene som ofte følger denne opplevelsen. Med andre ord demonstrerer avhandlingen hvordan maskinsyn og spill både forsterker og utfordrer dominante ideologier i menneske-maskin-relasjoner. Støttet av rik empirisk data fra å skape en database for maskinsynrepresentasjoner i 77 dataspill og tekstanalyser av utvalgte titler, gir denne avhandlingen et grundig innblikk i hvordan spill som dynamiske sammenstillinger («assemblages») kan presentere både posthumanistiske og transhumanistiske opplevelser på samme tid. De ulike aspektene ved maskinsyn i spill utforskes i fire artikler:

Den første artikkelen i denne avhandlingen dokumenterer den tverrfaglige utviklingen av en database og et datasett på hvordan spill, digital kunst og narrativer framstiller maskinsynteknologier. Artikkelen bidrar med datasettet og metodologiske diskusjoner rundt metodetriangulering i humaniora. Funnene fra artikkelen danner grunnlaget for videre nærlesing og tekstanalyser.

Den andre artikkelen undersøker hologrammers funksjoner i 24 spill. Gjennom en nærlesing av *Horizon Zero Dawn* (Guerrilla Games 2017) demonstrerer artikkelen at binære oppfattelser av tilstedeværelse og handlingsrom blir utfordret med spillhologrammer, både diegetisk og speilet i forholdet mellom spiller og spill.

Funnene bidrar til en forståelse av mennesker og maskiner som knyttet sammen gjennom handlingsrom i posthumanistiske sammenstillinger.

Den tredje artikkelen etterforsker hvordan kroppsliggjøring og handlingsrom blir påvirket av kameraet som metafor og som grensesnitt i spill. Basert på diegetiske kamera-representasjoner i 41 spill og nærlesinger av *Final Fantasy VII Remake* (Square Enix 2020) og *Watch Dogs: Legion* (Ubisoft Toronto 2020) bidrar artikkelen med konseptet «cyborg vision» for å gjeninnsette kroppen der maskinsyn presenteres som utenfor en kropp.

Den fjerde artikkelen viser hvordan kyborgers delvise perspektiv konstant blir utfordret av framstillinger av dominans og kontroll i spill med maskinsyn. For å demonstrere koblinga mellom maskinsyn og militært dominerende syn, analyseres visuelle filtre utenfor menneskelige sanser i *Call of Duty 4: Modern Warfare* (Infinity Ward 2007) og *Cyberpunk 2077* (CD Projekt Red 2020). Funnene framhever hvordan en forståelse av distribuert handlingsrom både muliggjør og kompliserer fantasier om dominans i spill.

Samlet sett demonstrerer artiklene at maskinsyn i spill alltid er mediert, ufullstendig og kroppsliggjort, men gjemt bak og medskyldig i narrativer om dominans. Denne spenninga mellom ufullstendige kroppsliggjorte agenter og totalitære ikke-kroppsliggjorte agenter er hvordan spill presenterer menneske-maskin-relasjoner gjennom maskinsyn. Spenningene for kroppsliggjøring og handlingsrom som oppstår brukes i avhandlingen til å utvikle en teorisering av spill som fundamentalt distribuerte og situerte fenomener i en sammenstilling. Avhandlingen bidrar til spillstudiekritikk av antroposentrisme og til en voksende akademisk interesse i spill fra posthumanistiske og feministiske perspektiver. Studien bygger også på mediestudier, overvåkningsstudier og teknologifilosofi for å utforske disse relasjonene.

List of Publications

The articles included in this article-based dissertation:

Article I / Rettberg, J.W., Kronman, L., Solberg, R., Gunderson, M., Bjørklund, S.M., Stokkedal, L.H., de Seta, G., Jacob, K., Markham, A. (2022). "Representations of Machine Vision Technologies in Artworks, Games and Narratives: A Dataset". *Data in Brief* 42. https://doi.org/10.1016/j.dib.2022.108319

Article II / Solberg, R. (2021). "Hologrammer i grenseland: Ikke-menneskelige aktørers tilstedeværelse og handlingsrom i spill" [Holograms in the borderlands: Non-human presence and agency in games]. *Norsk Medietidsskrift* 28(4). https://doi.org/10.18261/ISSN.0805-9535-2021-04-03

Article III / Solberg, R. (2022). "(Always) Playing the Camera: Cyborg Vision and Embodied Surveillance in Digital Games". *Surveillance & Society* 20(2). https://doi.org/10.24908/ss.v20i2.14517

Article IV / Solberg, R. (in review). "'Too easy' or 'too much'? (Re)imagining Protagonistic Empowerment through Machine Vision in Video Games".

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1. Introduction

After I have performed a successful cyberware attack in the simulation game *NITE Team 4* (Alice & Smith 2018)[1], Sergeant Wheeler, my commanding officer, presents the primary objectives for my next mission. We have identified a smarthouse system connected to our suspect, Dr. Ripper's, network. Dr. Ripper has recently acquired a military grade encryption code with which he can access highly secure content, and my objective is to secure or destroy the encryption code. I hack into the smarthouse system and select the patio's controls. From this menu, I, like Dr. Ripper, can control outdoor lights, open or close the spa cover, or preheat the barbeque. Turning on the heat for the barbeque, I go to satellite views of the surrounding area provided by a MQ-1 HeatCam Attack Drone and select a heatmap filter (figure 1). This filter shows me where there is an influx of heat when the barbeque is ready. Pinpointing the house's exact location is no trouble with the machine visions of thermal and satellite imaging, and I am free to strike or pull away as I see fit.

1: Drone and thermal visions in NITE Team 4

[1] *Digital* games unless otherwise specified. Digital games require a digital platform to be experienced and are marketed as "games". See section 3.2 for a closer discussion. Note that all genre description are taken from the MobyGames database, following the lead of Daneels et al (2022).

NITE Team 4 presents machine vision technologies such as thermal and satellite imaging as a natural element in the military-industrial-entertainment complex, perhaps unsurprising in a simulation game about espionage and military hacking. The purpose of the technologies is to identify, uncover, and attack, in the name of safety and protection. These technologies work together to empower the player character with more information, more opportunities for action and engagement, more knowledge. This representation is indicative of a recurring theme for machine vision in games. Apart from being a buzzword in technological development, machine vision is already engrained in game design and play.

Games have represented machine vision technologies for decades. With machine vision, the player characters I experience games through can identify houses based on drones reading barbeque temperatures, but also identify people based on their footprints (*Tom Clancy's Rainbow Six Siege*, Ubisoft Montréal 2015), save slumber party attendees from vampires (*Night Trap*, Digital Pictures 1992), and even see people long gone walk and talk in the physical space around them (*Tacoma*, Fullbright 2017). Player characters can be targeted by hostile drones (*Final Fantasy VII Remake*, Square Enix 2020), have their vision hacked (*Observation*, No Code 2019), or be left in darkness and fail to see incoming dangers *(Five Nights at Freddy's*, Cawthon 2014). In other words, there is a magnitude of examples of player characters in games that influence and are influenced with machine vision; the question is how.

A way to examine this influence is to acknowledge that these technologies are filters, selectively transmitting some visions at the cost of others. The thermal vision of *NITE Team 4* is a radically different aesthetic, a vision meant to illustrate how we imagine and capture visions outside of the human sensorium. The drone and satellite views provide an aerial perspective that the non-enhanced human body cannot attain. While we may accept this approximation of human and technologically enhanced beyond-human perspectives and visions within a virtual environment, the mediation through which it takes place is rarely accounted for during play.

Yet such representations are mirrored in the relation between player and game. I am, as the player, also provided with this new and filtered knowledge through the game presented on my computer, phone, VR device, or TV screen. The game system itself is involved in a translation act from machinic codes to machine vision, or rather, machine vision as imagined and made legible for a human user. Thus, through representations of machine vision within the virtual environment of games, "the body of the text gets implicated in the processes used to represented bodies within the text" (Hayles 1999, 23). Understanding machine vision representations in games is therefore also a matter of understanding the player-and-game relationship. From this perspective, machine vision is not a novel representation to indicate science fiction environments but a fundamental part of playing games.

Against this backdrop, it is necessary to consider how the heightened capacities of machines to see and otherwise influence the world shape our perceptions of and through technology. This dissertation examines what this shaping entails for the relationship between humans and machine vision technologies. From diegetic narratives and events to the relation between games and broader structures of society, I find that this relationship is presented as tensions between perceived binaries of embodiment/disembodiment and agency/non-agency. In the articles accompanying this synopsis, I focus on how these tensions are imagined in the influential cultural discourse of games through examining games-as-played. In this synopsis, I contextualize the articles' findings into how this imagination can help reconceptualize how we think about and play games.

The empirical base for this study is agential relations between humans, machine vision technologies, and other non-human characters in 77 games with a particular focus on what constitutes these relations (see chapter 3 on "Method and methodology" for a more extensive outline of how I gathered this data). In these games, characters can be understood as part of assemblages with technologies. By assemblage I mean a a mutating relational community, a scalable network that focuses on how agents are interdependent and work together (Hayles 2016). In the assemblage, characters can see with super-human eyes the smallest changes in

fingerprints or, as in the introductory example from *NITE Team 4*, the world from a bird's eye view. Machine vision changes the situated and embodied experience of its user. So too does playing games.

Games are well-positioned to aid us in thinking through the consequences of machine vision technology relations because they enact and represent at the same time. In games, players see and act in new worlds through other perspectives while simultaneously being outside the fiction. Some scholars therefore theorize games as cyborgian in how they embed human and non-human agents in cybernetic circuits when playing (Giddings 2005; Boulter 2015; Fizek 2018b; Keogh 2018; Wilde and Evans 2019). I build on these perspectives on the way games transgress boundaries of human and machine to find the tension points and ambivalent conceptualizations of human-machine relations. Instead of shying away from the messy entanglements that arise when discussing human-machine relations, especially for playing games, I see these entanglements as constitutive of relations. Thus, embracing the mess can provide insights beyond binaries and entrenchment into the distributed phenomenon of playing games. Using machine vision in games as a canvas upon which we can explore questions of embodiment and agency related to human-machine relations, I argue in this dissertation that the experience of playing a game must be considered as a fundamentally distributed and situated phenomenon between human and non-human agents, or, in other words, a way of playing posthumanism.

The question of how games imagine machine vision relations is also a question of from where this imagination is presented. Through the analyses presented in the articles and in this synopsis, the dissertation provides insights into how games and the act of playing them is often considered in contextual isolation in games discourse. The vernacular presupposition that games are different from other media because they are "interactive" and allow for "agency" is constantly emphasized in promotional material (Pötzsch 2015) and, from personal experience, in education, online debates, and everyday conversations. Such approaches hide important agents and risk furthering dominant discourses in game culture, in contrast to academic calls

for the necessity of untangling hegemonic tropes of game protagonism and exceptionalism (Fron et al. 2007; Jayanth 2021; Jennings 2022).

Tropes of machine vision empowerment can be placed under scrutiny. Games highlight an already uncertain and multiplied identity based on the interconnection of physical world, player, game technology and engine, player character, and virtual environment. This destabilized identity is often presented as a point of conflict in game studies but becomes the source of an interrelational networked identity through a posthuman lens (Haraway 1988; 1991; Hayles 1999; 2017; Braidotti 2013). In short, games can allow us to play out versions of breaking away from anthropocentric idealism and thus experience new modes of subjectivity. Consequently, considering games as fundamentally distributed and situated phenomena between human and machine agents paves the way for a larger reconceptualization of power, privilege, and identity, one in which games are not unique but uniquely positioned to think and play through what such a reconceptualization would entail.

In the fictional realities of cultural artefacts we find investigations into the limitations and possibilities of speculative pasts, presents, and futures. Games, films, TV shows, novels, artworks, music, and other cultural expressions exaggerate societal issues to scrutinize or comment on them, and they help shape what David Lyon (2018) refers to as our social imaginaries. Social imaginaries in turn fuel social practices – what we do – and therefore show possibilities for the present and the future. Thus, popular culture provides us with vocabulary, aesthetics, and expectations of what could potentially happen. Subsequently, my research builds on an increased academic interest in the possibilities of games as facilitators for real-world change (Bogost 2008; McGonigal 2011; Flanagan 2016; Gray and Leonard 2018) but does this from a more conceptually oriented position. My foundation is that fiction functions on multiple levels; as a symptom that reflects attitudes already circulating in society; as an inquiry or critique into possible consequences of a certain trajectory; and as a tool for shaping the future. This is not to say that all (science) fiction prophesies come to pass, but to acknowledge the power of cultural discourse.

As *NITE Team 4* points toward, machine vision is structured around tensions. On the one hand, machine vision technologies and games are presented and discussed as superhuman empowerments of the (human) user that attempt to hide embodiment and allow you to see and know and control everything. On the other hand, posthuman conceptualizations of the same technologies call for "situated embodied knowledge" (Haraway 1988) and "being a body instead of possessing a body" (Hayles 1999). I use the title of "Playing posthumanism" to encapsulate the tensions between these views. Playing posthumanism can be "playing" as tricking or bypassing posthuman ideas with promises of superhuman empowerment *and* it can be a way of playing that relates in a posthuman manner to the game. The former is the powerful narrative of transhumanism that disregards embodiment under the guise of posthumanism. The latter is a transgressive or destabilizing activity that challenges power fantasies in machine vision and games alike and instead considers the distributed and partial, situated relations of human and machine agents.

1.1 Machine vision and where to find it

For the purpose of this study, machine vision is the "registration, analysis, and representation of visual information by machines and algorithms" (Rettberg et al., 2019). It includes technologies that read and represent visual information, such as surveillance cameras; technologies that compare and contrast visual information, such as facial recognition and biometrics; and technologies that change or enhance visual information, such as filters and augmented reality (see figure 2 for a complete list). The definition notably includes the entire perceptual process and not just the ocular sense alone. As explained in the dissertation, it makes actions important components of machine vision, often tied to the processual capabilities of artificial intelligence.

3D scans	artificial intelligence	augmented reality
biometrics	body scans	camcorders
cameraphone	drones (UAV)	emotion recognition
facial recognition	filtering	holograms
machine learning	microscope/telescope	motion tracking
non-visible spectrum	object recognition	optical/ocular implants
satellite images	surveillance cameras	drones (UGV)
virtual reality	webcams	

2: Machine vision technologies represented in games

Since fictional representations are free to imagine worlds that are different from ours – where technologies can do what ours currently cannot – my research begins with diegetic representations of machine vision. These can often but not always be more speculative than existing uses. Diegetic machine vision includes the subterranean drone's infrared camera in the adventure strategy game *Hacker* (Activision 1985) and the player character Aloy's augmented reality device in the role-playing game *Horizon Zero Dawn* (Guerrilla Games 2017). Also included are interfaces if they are presented as being part of the player character's fictional universe as a narrative or aesthetic preoccupation. This includes the action game *Assassin's Creed IV: Black Flag*'s (Ubisoft Montréal 2013) fictionalized interface, where the user interface is presented as machine vision for the player character *and* the player. Such diegetic representations in games are entangled with other representational modes of being set in a game. Thus, the technologies we surround ourselves with and the technologies that are encountered in the virtual environments of games blend into each other in my research. Because games represent and enact at the same time, the game itself can be seen as machine vision[2]. A game visualizes the system and rules that govern behind its representational layer. With heads-up displays (HUDs), brightness indicators, map

[2] Which also includes other non-fictionalized representations, for instance player interfaces (presumably unseen by the fictional world's inhabitants), and "non-machinic" machine vision such as eagle vision or affective vision, which are non-machinic in the fictional framing of the game but not for the player. The difference between eagle vision and drone vision is in the narrative framing, but often has consequences for which actions and aesthetics a player is met with.

menus, and virtual environments, the play experience is also one of machine vision. The inevitable collapse between diegetic representations and the game system is a finding further discussed methodologically in section 3.2 and as a tension in chapter 5.

My interest in machine vision arises from concepts such as Harun Farocki's (2004) "operational images", whose function as machine-readable are more important than their aesthetics and legibility for human viewers. Game studies is beginning to see how Farocki and other visual theorists can help rethink "the image" and avoid treating representation and computation as separate dimensions (Fizek 2022). As automatic recognition technologies and smart systems increasingly operate outside of the human sensory realm and find their way into our systems and devices, they challenge understandings of the human's role in (visual) culture. Scholars continue to question how these systems operate and call for critical review of their implications in the future (e.g. Cheney-Lippold 2017; Zuboff 2019), especially in reproducing and reenforcing bias and stereotypes for marginalized communities (Magnet 2011; Browne 2015; Buolamwini 2016; Eubanks 2018; Benjamin 2019; Rettberg 2019). This connection to domination and hegemony is evident in how machine vision is often associated with and discussed in militarized terms of control (e.g. Bousquet 2018).

1.2 The Machine Vision project

The present PhD study was initiated and conducted within the interdisciplinary project *Machine Vision in Everyday Life: Playful Interactions with Visual Technologies in Digital Art, Games, Narratives and Social Media*. The aim of the Machine Vision project is to investigate how we experience algorithmic images and to develop a theory of how everyday machine vision affects how we understand ourselves and the world (Rettberg 2017). Focus areas for the overall project are the development or limitations of new kinds of agency, how malleable visual data can influence how we think about ourselves, and values and biases that are embedded in machine vision technologies. As the Machine Vision project is still, at the time of

writing, ongoing, the knowledge generated by this dissertation and its articles continue to add to the overall project's theoretical mission.

My study was informed by one of the research areas of the Machine Vision project, namely the focus on games. Other research areas in the Machine Vision project that complement this game focus include machine vision in digital art, narratives (a broad interpretation including films, novels, electronic literature, etc.), and vernacular machine vision (see the appendices for explanations of individual contributions in the Machine Vision project). Therefore, for clarity in the dissertation, references to the overall Machine Vision project's research refers to "project", whilst references to my individual research is labelled "study" or "dissertation". My dissertation is a theoretically grounded study supported with empirical evidence as part of the larger research project.

1.3 Research question

This dissertation articulates how we imagine and play with increasingly agential technologies in games and how this is supported or contrasted by the game's mediation as experienced by the player. The main research question is:

> *What characterizes machine vision in games, and how are human-machine relations explored through machine vision in games?*

In order to answer this research question, I first gain an overview of machine vision relations and characteristics across several games and gather this data into a dataset to use as the empirical groundwork for further research. This is done through extensive data collection and using a database structure to gather the broad sample needed for distant reading and network analyses (Article I). I then divide the main research question into supplementary questions that more specifically address parts of the research question, building on findings from the process of creating the dataset. These subquestions are explored in their own devoted articles:

Which aesthetic, narrative, and mechanical functions does machine vision have in games? (Article II) *How do games reconcile the relationship between agents when the interface is thematized as machine vision?* (Article III) *How is agency distributed in games where machine vision is about domination and mastery?* (Article IV)

These solo-authored articles use textual analysis to qualitatively examine the content of select games.

1.4 Dissertation overview

This is an article-based dissertation consisting of four articles and a synopsis. This section will first outline the four articles before giving an overview of the synopsis.

Article I, "Representations of Machine Vision Technologies in Artworks, Games and Narratives: A Dataset", documents the interdisciplinary development of a dataset on how machine vision technologies are imagined in games and other cultural artefacts. The results are presented in a joint article that describes the dataset of 500 creative works (77 games, 190 digital artworks, and 233 films, novels, and other narratives) that use or represent machine vision technologies. My unique contribution is specified in the appendices to this dissertation ("Individual contributions to the Database of Machine Vision in Art, Games and Narratives").

Article II, "Holograms in the borderlands: Non-human presence and agency in games", examines the trope of holograms in games, especially the ambiguities of player character relationships with holographic non-player characters. To answer the subquestion *Which aesthetic, narrative, and mechanical functions does machine vision have in games?* I identify holographic representations in 24 digital games and performs a close reading of hologram functions in the role-playing game *Horizon Zero Dawn* (Guerrilla Games 2017). I argue that the holograms' aesthetic, narrative, and mechanical functions challenge binary conceptualizations of presence and agency, both in the diegetic virtual environment and mirrored between player and

game. This formal and thematic mediation helps us see how machines and humans are connected through agency in complex posthuman assemblages.

Article III, "(Always) Playing the Camera: Cyborg Vision and Embodied Surveillance in Digital Games", examines the camera as interface and how this impacts embodiment and distribution of agency. The article begins by identifying the importance of the camera metaphor and representation in games in forty-one titles. To answer the subquestion *How do games reconcile the relationship between agents when the interface is thematized as machine vision?* I perform in-depth analyses of two 2020 games that present embodied surveillance camera perspectives, the role-playing game *Final Fantasy VII Remake* (Square Enix 2020) and the action game *Watch Dogs: Legion* (Ubisoft Toronto 2020). I demonstrate that the camera is an often-forgotten agent in the relation between those who watch or are watched with cameras. We think and play with and through cameras, drawing attention to and problematizing the partial perspectives with which worlds are viewed. I propose the concept of "cyborg vision" to account for this simultaneously human and machine vision that is both pluralistic and situated.

Article IV, "'Too easy' or 'too much'? (Re)imagining Protagonistic Empowerment through Machine Vision in Video Games", examines the ideal of the partial perspectives of cyborgs as constantly challenged by the depictions of mastery in games with machine vision. To answer the subquestion *How is agency distributed in games where machine vision is about domination and mastery?* I present how visual filters beyond the human spectrum are depicted as experienced by player characters in the action game *Call of Duty 4: Modern Warfare* (Infinity Ward 2007) and the role-playing game *Cyberpunk 2077* (CD Projekt Red 2020). Starting from diegetic representations, I demonstrate the close connection between machine vision and militarized visions of domination. Moments when the technology with which we see is shown as being in control or otherwise disrupting the god-like interventions of the human are examined as explicit cases of machine agency as part of a broader assemblage. I argue that vision in games is inherently tied to questions of agency and

that understanding agency as shared with machines both enables and complicates fantasies of dominance in games.

The term for a dissertation synopsis in Norwegian is “kappe” (literally: cloak), which shows how it thematically wraps around the articles. This synopsis consists of six chapters. The present chapter has established the background, aim, and argument of my study. Chapter 2, “Conceptualizing the posthuman”, positions my in-depth analyses and overall theoretical approach in a theoretical tradition by outlining relevant topics in posthuman studies and game studies and emerging cases of posthuman game studies. Chapter 3, “Method and methodology”, presents and discusses methodological choices during my study. These are first considered in light of issues related to data collection from a game scholar’s perspective in the overall Machine Vision project, and how a database as analysis model informs quantitative analyses. I then present considerations of performing textual analyses of games and the role of the researcher-as-player. Chapter 4, “Summary of the articles”, summarizes the main contributions of the articles in the dissertation. In chapter 5, “Tensions of human-machine relations in games”, I synthesize the overarching tensions of human-machine relations that I identify in my articles into a discussion of embodiment and agency in gameplay. Chapter 6, “Conclusion: Being-in-the-assemblage”, concludes that machine vision in games is characterized by a double-orientedness that caters to the fictional world and to the player-and-game relationship. Machine vision is always mediated, partial, and embodied, but hidden behind and complicit in narratives of domination. This tension between partial, embodied agents and totalitarian, disembodied agents is how games present human-machine relations. These tensions are used to develop a theorization of games as fundamentally distributed and situated phenomena through the understanding of being-in-the-assemblage. This chapter also highlights potential paths for further research.

2. Conceptualizing the posthuman

As computational artefacts and artificial intelligences increasingly become entangled with human cognition, there is an increased need for theoretical frameworks that acknowledge (and embrace) such entanglements. Computational artefacts can act both in conjunction with and outside of player influence in games, which shows how agential roles are not necessarily reserved for human players. To account for the complexities of 21st century human-machine interactions, non-humans must be included – even when their contribution is hidden.

Posthuman theories provide ways to conceptualize agential roles that are not exclusively human. Posthumanism is a conceptual framework to counter problematic assumptions within classical Humanism, aiming to blur the dichotomies that have long dominated predominantly Western thought. The convergence of posthumanism with post-anthropocentrism (Braidotti 2022), especially the insistence that "human" is never a neutral category, makes this framework apt for understanding hierarchies and rethinking agential relations in alternative ways (Berg, Bolsø, and Hellstrand 2020). Posthumanism thus helps decentralize and challenge hegemonic views of the human. My use of the term hegemony refers to dominant ideologies that justify and uphold inequal structures in society but also includes physical domination as seen thematically in some of the games (see e.g. Hammar 2017 for hegemony research in game studies).

Posthumanism is one of several theories that emerged as critiques of classical Humanism and is therefore not alone in exploring entanglements of humans and non-humans. The posthuman terms I use here are reminiscent of other theoretical frameworks such as postphenomenology and actor-network theory (ANT). For instance, postphenomenology focuses on *relations* (Ihde 1990; Verbeek 2005) and postphenomenological theorists even use the figure of the *cyborg* (Verbeek 2008). Meanwhile, ANTs networks of agents ("actors" in ANT, e.g. Latour 1999) has proved useful for scholars to explain how computational systems take control in games (Giddings 2005; Harrell and Zhu 2009; Muriel and Crawford 2020). My focus

on posthumanism builds upon these perspectives while also including the critical feminist perspective that I see as fundamental to posthumanism. My aim is therefore not to contribute to the discussions between posthumanism and postphenomenology or ANT, but rather to exemplify that there are several strands of theory that attempt to destabilize hegemonic views of the human, which strengthens the view that such an intervention is needed.

Posthumanism has gained popularity in games research. Building on the way games transgress boundaries of concepts such as human and technology, scholars theorize games as cyborgian in how they embed human and non-human agents in cybernetic circuits when playing (Giddings 2005; Boulter 2015; Fizek 2018b; Keogh 2018; Wilde and Evans 2019). Research utilizing posthuman perspectives in game studies emphasize that concepts such as player, agency, and immersion follow a tradition of culture and marketing that enforces already entrenched biases (Keogh 2018; Jennings 2019). The posthuman opens for investigations into the consequences of these sociocultural conceptions of human-machine relations.

The posthuman is a theoretical foundation and conceptual framework throughout my research into *What characterizes machine vision in games, and how are human-machine relations explored through machine vision in games?* Therefore, this chapter provides insight into posthumanism and its framing for my dissertation. While posthumanism has been developed by several theorists from different fields, key aspects for this study are the concepts of assemblages, the cyborg, and situated (embodied) knowledge. Combined, scholars such as Rosi Braidotti (2013), N. Katherine Hayles (1999; 2017), and Donna Haraway[3] (1988; 1991) provide ways of thinking about such embodied human-machine interactions that do not reenforce marginalization and dominance but rather focus on the actual relationships and effects of these relationships. After this introduction on critical posthumanism, I turn to an overview of how game studies have interacted with the posthuman.

[3] Although Haraway later distanced herself from the term posthumanism (Gane and Haraway 2006) she uses the same terminology and acknowledges the uses of posthumanism that e.g. Hayles presents.

2.1 Decentering the human

Posthumanism is a broad term that can be used in contradictory ways. My use is as an affirmative convergence of posthumanism and postanthropocentrism, or a critical posthumanism. Critical posthumanism is "perspectives that challenge the unexamined anthropocentric, Western, white, colonial and patriarchal meanings that are implicated in humanism, and in the wider imaginaries the word 'human' evokes" (Braidotti and Hlavajova 2018). Critical posthumanism allows for examining, questioning, and potentially disrupting dominant power structures. It should not be confused with the transhuman views often ascribed to posthumanism because of the name. In other words, *post*humanism is "beyond", not "after".

Posthuman scholars call for the need to decenter the exceptionalism of the human subject by critiquing Enlightenment-era humanist notions of the human as an autonomous and rational being who operates independently of other factors. These humanist fantasies are pervasive conceptualizations which force a split between the human being on one side and everything else on the other side; or rather, a strict hierarchy where the power is in human hands. Particularly, the Cartesian split of mind and body feeds this idea because human cognitive functions are seen as superior to other cognitive systems. The posthuman project acknowledges this injustice. The main point is that the human, and a hegemonic human at that, is no longer fixed at the center and top of the hierarchy.

The decentering of the human in general and a particular kind of human specifically is articulated in Rosi Braidotti's (2013) work. Braidotti shows that through the dualisms and hierarchies of superiority and inferiority with which society operates, some humans are treated as more human than others. This emphasis is seen throughout feminist, queer, critical race, postcolonial – and posthuman scholarship. Capitalized by Braidotti to show it as a concept, this specific kind of Human – which Braidotti stresses is white, Western, male – alienates those who fall into the category of "Others". In this view, you are either Human or you are Other. Those in power can place anyone and anything they want into the category of Other. Especially those who

are physically or mentally disabled, and sexualized, racialized, and naturalized others draw the short end of the stick in binary views between "normative" and "different". Braidotti (2013, 15) illustrates this by playing on Orwell's *Animal Farm*: "We are all humans, but some of us are just more mortal than others". Considering issues of gender, race, ethnicity, dis/ability, and class, the human itself is a categorization that excludes and retrenches binaries.

Like Braidotti, N. Katherine Hayles (1999; 2017) critiques this version of the human. Hayles (1999, 286) agrees with Braidotti that the ability to conceptualize oneself as a fully autonomous being is ever only reserved "to that fraction of humanity who had the wealth, power, and leisure to conceptualize themselves as autonomous beings exercising their will through individual agency and choice". In other words, the ability to conceptualize oneself as autonomous is intrinsically connected to power and position.

Across her academic work, including works such as *How We Became Posthuman* (1999) and *Unthought* (2017), Hayles' view of the posthuman contains a sense of urgency to revisit and reconceptualize constructions of society, self, and others. Particularly the body, rather than being an "intrinsic part of the self", has become "an object for control and mastery" (Hayles 1999, 5). As Hayles (1999, 4) explains, "the liberal subject *possessed* a body but was not usually presented as *being* a body". Thus, the legacy of Enlightenment humanist ideas creates the human into a fully autonomous being. What such a subject does not acknowledge is the troubling, porous, and blurry aspects of being; the human as constantly interrelated with human and non-human agents alike.

To understand Hayles' posthumanism is to acknowledge that no human operates without constraints but rather relies on the surrounding world – on a functioning ecosystem, on technology – and that these influence humans as humans influence them. Instead of picturing a tower where the human is on top, Hayles (2016) pictures an assemblage; a mutating and relational community where the human is relocated as one of many agents instead of an exceptional being of domination and autonomy. In

assemblages, the human is dependent on other agents. These other agents include other humans, technical systems, animals, and the environment.

Reconceptualizing the human is needed not just for relationships such as human-nature or human-machine continuums (which also, incidentally, separates the human from the rest), but for humans as well. In Hayles' (1999, 290) words,

> As long as the human subject is envisioned as an autonomous self with unambiguous boundaries, the human-computer interface can only be parsed as a division between the solidity of real life on one side and the illusion of virtual reality on the other, thus obscuring the far-reaching changes initiated by the development of virtual technologies.

However, when the human becomes an agent in a distributed system, "the full expression of human capability can be seen precisely to *depend* on the splice rather than being imperiled by it" (ibid). For Hayles (2016, 45), the human is not outside or above. Instead, humans are a part of a broader system that enables a critical engagement with the complex embodiments of everyday assemblages with cognitive machines[4]:

> Cognitive technologies show a clear trajectory toward greater agency and autonomy. In some instances, they are performing actions outside the realm of human possibility, as when highfrequency trading algorithms conduct trades in five milliseconds or less, something no human could do. In other cases, the intent is to lessen the load on the most limited resource, human attention—for example, with selfdriving cars. Perhaps the most controversial examples of technical autonomy are autonomous drones and robots with lethal capacity, now in development. In part because these technologies unsettle many traditional assumptions, they have been sites for intense debate, within both the military and civilian communities. They can therefore serve as test cases for the implications of distributed agency and, more

[4] Hayles specifically focuses on cognitive assemblages, e.g. systems of "transformative potential" (2017, 119) enabled by the interaction between human and technical cognizers (a non-anthropocentric conceptualization of agent, including cognizant machines), with the internet being a prime example. For Hayles, cognition is an interpretive process that does not require consciousness. Rather, it is a broader faculty that is present in all life-forms and some technical systems. These cognitive assemblages therefore raise questions on "how agency is distributed" and consequently "how responsibilities should be apportioned" (Hayles 2017, 119). Interestingly, two of the three examples Hayles mentions in the excerpt are machine vision technologies (selfdriving cars and drones), which shows the close connections between cognition, action, and machine vision.

> broadly, for the ways in which cognitive assemblages interact with complex human systems to create new kinds of possibilities, challenges, and dangers.

Assemblages are therefore understood as a type of scalable, interconnected, and dynamic networks (Hayles 2016). Using the assemblage as a starting point illustrates how agents are interdependent while also being separate, a notion that might appear impenetrable but is easily imagined from our relationships with the increasingly complex and "lively" (Haraway 1991, 152) technologies around us. Posthuman assemblages, because they fluctuate and agents are interdependent rather than fixed, suggest that there should not be a normative hierarchical structure between agents. To aid in this restructuring, I use the concept of the cyborg – a conceptual figure present throughout my research but explicitly explored in Article III through the concept of cyborg vision.

2.2 Enter the cyborg

A way to decenter the human and embrace inderdependent relationships with technology is the cyborg. The cyborg, or cybernetic organism, evokes a picture of a part-machine part-human being as presented in science fiction games, literature, and films. An online search for cyborg reveals comic book characters with machine bodies and organic faces. Blurring the lines of demarcation usually associated with humans and machines, cyborgs in popular culture represent possibilities but also fears related to other beings' intelligence and power. They evoke the sentiments associated with narratives where humans and machines live in harmony, but also where machines revolt against their creators, with well-known examples like Shelley's *Frankenstein; or, The Modern Prometheus*, Čapek's *R.U.R.*, and the *Westworld* TV series (Cave et al. 2018). Importantly, the cyborg as a hybrid being can contain these conflicting views.

The often-attributed original use of the word cyborg (Clynes and Kline 1960) points towards this conflict. In their original use, Manfred E. Clynes and Nathan S. Kline use the example of space travel and how man must be the one to adapt to these new surroundings for space travel to be successful. The human's adaptation to the

environment shows that the cyborg is non-anthropocentric. But I would point out that it is also firmly anthropocentric, because Clynes and Kline emphasize the separation between machinic actions and the more "human" actions of thinking, feeling, and creating. This separation reads as a hierarchical structure where the human's actions are better or more important than what the machine does.

Donna Haraway's (1991) cyborg builds upon the idea of the cyborg but without resorting to a strictly dichotomic presentation. Haraway plays upon the tropes and conflicting views about the cyborg and turns the cyborg into a liberative source of power. As such, Haraway's cyborg is a liberation from patriarchy and a support for socialist-feminist theory and feminist epistemology. It is Haraway's (1991, 176) hope that this "illegitimate offspring" of "militarism and patriarchal capitalism" will be "exceedingly unfaithful to (its) origins"[5].

With the influential "A Cyborg Manifesto", the cyborg is introduced as both a fictional creature and as a creature of social reality. In Haraway's (1991, 149; 163) words, a cyborg is "a hybrid of machine and organism" and "a kind of disassembled and reassembled, post-modern collective and personal self". It is a means of exposing how our categorizations and practices can look at something as subhuman and scrutinizes areas of control and exploitation based on the restricted notion of what counts as "Human", mirroring Braidotti (2013) and Hayles (1999; 2017). The cyborg is a hybrid creature that can surpass dualisms between culture and nature, self and other, and female and male. In surpassing these dualisms and destabilizing systems of domination, the hybridity of the cyborg helps to conceptualize new ways of explaining and theorizing bodies.

2.3 Embodied perspectives

For some, the cyborg might signal a utopian dream of living beyond biological confines and promise a kind of immortality. Becoming cyborg or becoming machine

[5] Haraway (2003) later notes that the applications of the cyborg has indeed surpassed what she envisioned in her research, for instance by referring to it as a Rorshach test. The Rorshach exemplifies the possibility for multiple meanings in the same figure.

to surpass mortality is an imaginary often reproduced in popular culture. A powerful image is that of becoming data; a science fiction trope that indeed many games present. Independent of a singular body, data can create bodies of holograms, use vessels such as androids, or distribute and connect a whole network of prosthetic tools. Data transcends the body into an incorporeal form.

According to Anne-Jorunn Berg, Agnes Bolsø, and Ingvil Hellstrand (2020), these are the images of transhumanist conceptualization, often (mis-)attributed to critical posthumanism. Similarly, for Hayles (1999), such conceptualizations erase the (flesh and) body that this information depends on. For that reason, Hayles remarks that for information to exist "it must always be instantiated in a medium (1999, 13). In fact, "conceiving of information as a thing separate from the medium instantiating it is a prior imaginary act that constructs a holistic phenomenon as an information/matter duality" (ibid). Thus, the deconstruction of what Hayles calls the "liberal humanist subject" is necessary to bring back information's bodies. Supported by posthumanist scholars, I see it as important that the productive hybrid imaginary of the cyborg does not lose its embodiment. Rather, the cyborg helps to see that a machine "is not an *it* to be animated, worshiped and dominated. The machine is us, our processes, an aspect of our embodiment." (Haraway 1991, 203). A being of biological and technological embodiment, it cannot dismiss either. The cyborg constructs and embraces bodies and selves that are permanently partial (Haraway 1991, 157).

A partial body allows for multiple epistemological perspectives. But vision, however extended and enhanced, is always embodied. In her essay "Situated Knowledges" (1988), Haraway argues that perception is always a matter of the embodied subject. To know something is to be embedded in a specific historical and cultural context which affects knowledge production. Knowledge reflects the situation in which it is produced. This means that we cannot "distance the knowing subject from everybody and everything" (Haraway 1988). Contemporary attempts at extending human eyes with satellite images or microscopic cameras to see everything hearkens back to the view of the body as data, and our vision (and agency) extending to infinite lengths.

Haraway (1988, 582; 583) reminds us that infinite vision and complete objectivity is "an illusion, a god trick":

> The "eyes" made available in modern technological sciences shatter any idea of passive vision; these prosthetic devices show us that all eyes, including our own organic ones, are active perceptual systems, building on translations and specific *ways* of seeing, that is, ways of life. There is no unmediated photograph or passive camera obscura in scientific accounts of bodies and machines; there are only highly specific visual possibilities, each with a wonderfully detailed, active, partial way of organizing worlds.

The promise of a disembodied vision that sees everything cannot be fulfilled because vision "is *always* a question of the power to see" (Haraway 1988, 585). The technologies with which we see position us in a specific relation to the world. These technologies, then, must be "pictured as an actor and agent, not as a screen or a ground or a resource" (Haraway 1988, 592) because they are active components in vision and knowledge production. In other words, we must deconstruct the myth of an objective perspective and bring machine agents into the light.

Before continuing, I wish to note that there is a tendency in scholarly discourse and research to glorify prosthetic involvement and prostheses, especially in human-computer interaction (e.g. Mueller et al. 2020). Such approaches move towards transhumanist fantasies and forget that beyond engagement with technologies, there are many literal cyborgs in the world today, with vital technological implants like pacemakers or artificial limbs and systems. Yet instead of focusing on accommodation and accessibility, technologies are seemingly created to "fix" people, and those reliant upon the technologies are depicted through cyborg super hero tropes (Fox 2021). The cyborg with which I operate is a conceptual construct of corporeal integration. I see this concept as a solidary position that does not attempt to speak for a monolithic human or non-human nor attempt to erase class, gender, dis/ability, or cultural differences. Rather, the conceptual cyborg emphasizes that agents are always embodied and constructed in a specific way, which influences relations, perceptions, and actions. This view of the cyborg helps counter the omniscient and omnipresent

ideals associated with machine vision and games alike. I will return to this in detail in chapter 5.

2.4 Posthuman game studies: an overview

As in the overall posthuman research field, game studies research relating to posthuman ideas is diverse. Although perhaps not all the following scholars would classify themselves as belonging to a posthuman game studies, the basic tenets of their research align with the posthuman project – which I see as examining the oscillating dynamic between human and machine agents in games, and troubling hegemonic discourses in game culture. As these two points feed into each other, they will be discussed alongside each other.

The breadth of the concept of the posthuman in game studies research includes but is not limited to exploring: the player's cybernetic subjectivity in play (Keogh 2014; Boulter 2015; Mckeown 2021); non-human agents in play (Björk and Juul 2012; Fizek 2018c; Keogh and Richardson 2018; Ruffino 2020; Ruberg 2022), ethical considerations (Janik 2018); player character empathy and identification (Wilde and Evans 2019; Wilde 2020; Gallagher 2022); and distribution of agency (Jennings 2019). There is an increased interest in manifestations of others' agency (Janik 2017; Taylor 2018; Egliston 2020). Moreover, understanding players and games through the lens of the cyborg (Vist 2015; Keogh 2018; Lammes and de Smale 2018; Seller 2022) contributes to a troubling of hegemonic structures embedded in these.

At the core of this scholarship is the assemblage, which in games comprises agents such as "system, technologies, player, body, community, company, legal structures, etc." (Taylor 2009). The core idea is that there is no absolute line of demarcation between humans, machines, and nature (even if I separate them with commas for orthographic reasons and semantic effect), and that these have continuous influence over each other. Assemblages allow us to look at the flow between agents. Our interactions with machines are therefore not of binary subject/object relationships, but rather complex situations of interconnected agency. Rethinking the pedestal "the

human" is placed upon allows more focus on the relations between the interconnected agents and thus opens for more nuanced analyses of the complexity of our relationships with technology.

Combined, these perspectives offer starting points to analyze porous and malleable human and machine agents. Chapter 5, "Tensions of human-machine relations in games", builds on these theories to understand relations of embodiment and agency in and with games. However, not all see such perspectives as productive for the game studies field (Krzywinska and Brown 2015; Chang 2017; Kocurek 2018; Keever 2022)[6]. Their main concern can be summarized as that the posthuman becomes a guise for reinforcing Humanistic values under the pretense of novelty[7], which actively hinders investigations into underlying systems of power. Reinserting the posthuman into its body/ies is a way of countering this perception of a universal posthumanism, or in its correct term, transhumanism. The concepts of cyborg vision (Article III, elaborated in section 5.1.2) and distribution of agencies (elaborated in section 5.2.2) are further attempts at such a repositioning.

What is evident from these critiques is that we need to find a way to decenter the hegemonic masculinist confidence of control[8] that is embedded in computational artefacts as a whole and games specifically, and approach this uncertainty without

[6] Exemplified, Krzywinska and Brown critiques consumerist motivations, and their concern is by no means lessened when including science fiction narratives in games, because they are "fetish-forming evangelisation: both contribute to the construction of a pre-hyped pent-up, market for new technology by creating possibility spaces for imagining what can be done by altering our code." Haraway's cyborg is "anti-human" and "cold" and Braidotti's writing is "utopian imagining". The posthuman as Krzywinska and Brown see it is a guise for a seductive consumerist agenda. In making this accusation, they misattribute transhumanist ideals on the posthumanism.

[7] Notably, both Krzywinska & Brown and Chang rely heavily on the action game *BioShock* (2K Boston 2007) for their analyses. Although *BioShock* might be "an excellent example of video games as a vernacular posthuman technology" wherein the player is liberated "from the limitations of embodiment through the cyborg medium of video games" (Chang 2017), it is important to not extrapolate generalized views from one or a few game examples (as (Jennings 2019) points out is often done – especially for *BioShock*).

[8] Games and the act of playing them is often depicted "within a masculine framework of violence and domination" (Cover 2018). I view this as a certain performance of a conventional technomasculinity (Johnson 2018) that can be "re-tooled" (Bell, Taylor, and Kampe 2015) into performing non-hegemonic masculinities (Kagen 2018).

trying to control it (Ruffino 2020). As Paolo Ruffino (2020, 16) points out, the "possibilities of a video game are generated by mobilizing the physicality of human and nonhuman actors, and by destabilizing the definitions of both". My attempt to blur the boundaries between human and machine in games by building on posthuman theories is not meant as a deletion of the other or a continuation or advancement of fundamentally unequal Humanistic structures. Rather than to overwrite the non-human[9], I acknowledge the human as situated in assemblages where they are dependent on other agents. This chapter shows how posthumanism emerges as a framework for broadening what it means to be human and part of a world.

[9] I see the terms non-human (and non-player character, NPC) as problematic in that they group everyone and everything that is not "human".

3. Method and methodology

This chapter outlines how I approached finding, playing, analyzing, and logging games in a database dedicated to machine vision technologies in everyday life (Rettberg et al. 2021) and how I performed textual analyses of selected games in order to answer the main research question: *What characterizes machine vision in games, and how are human-machine relations explored through machine vision in games?* I also discuss methodological concerns with this venture. Rather than choosing one specific research design, I use mixed methods to gain an overview and in-depth perspectives on machine vision in games. The methods are closely linked to the theoretical underpinnings as established in chapter 2. This chapter is structured as follows: In section 3.1, I present the background for the choice of a mixed methods study using a database structure combined with textual analyses. Then, in section 3.2, I explain the criteria for and process of selecting the 77-game corpus. Section 3.3 outlines the Machine Vision database structure and its implications for my study. A consideration of textual analysis as a method in game studies is presented in section 3.4, before ending this chapter in section 3.5 with field notes and examples to illustrate my research and play as an embodied experience.

3.1 Choosing the methods

Before I go in detail on *how*, I wish to outline *why*. To find the answer to what characterizes machine vision in games, there are some prerequisities to consider. There should be a sample of games with machine vision, which necessitates identifying the correct games. This identification, in turn, can be achieved through for instance playing, previous knowledge, or tags and algorithms. Ideally, this should be a broad sample, to possible generalize the findings but most importantly, following posthuman scholarship on decentralization of the normative, to identify depictions that challenge the norm. The introductory analyses and distant reading techniques of quantitative/mixed data can, however, only provide data on what is fed to them. Therefore, after gathering a detailed understanding of the characteristics of machine vision in games, this data is supplemented with textual analysis to answer how

human-machine relations are explored through machine vision. Textual analysis was chosen because it gives detailed information about the combination of individual components as it is received and interpreted, finding broader insights in the chosen text. Moreover, approaching games-as-played through a broad model of textuality is a tried and used method in game studies research that offers "a basis for exploring the relationship between text and play" (Carr 2009). This relationship is at the core of my research question on relations between humans and machines.

The choice of gathering and analyzing games in a database might at first seem counterintuitive since this dissertation is firmly located in a theoretical tradition that problematizes binary conceptualizations. Indeed, the strict zeroes and ones of database systems have posed a conundrum to the qualitative nature of my research. Research in game studies has used quantitative data to examine for instance gender and queer representation (Heritage 2021; Shaw et al. 2019), showing that the balance between complex representations on the one hand and binaries on the other hand can and sometimes must be done to gain a larger picture – so long as one does not disregard that which is lost when quantifying complex data[10].

There are several reasons for using a database structure to gather the data. First, the archivized data is openly accessible for reuse and the database infrastructure lends itself to easy navigation and download from for future use, or critique or build upon in one's own research (Chauvette, Schick-Makaroff, and Molzahn 2019; DuBois, Strait, and Walsh 2017). Second, the Machine Vision project had an existing database structure to build on and a programmer, which meant that we could adapt the database to better suit our project's goals. See section 3.3 for further explanation of how this was done. In effect, the database structure becomes a guide for analysis depending on its input format, similar to structured and open questions in interviews. Last, because my study exists within a broader collaborative research project, the

[10] When data is generated under such particular contextual conditions such as the Machine Vision project's, qualitative secondary analysis opens the data for risks such as decontextualization (DuBois, Strait, and Walsh 2017; Sherif 2018). However, the benefits are deemed to outweigh the risks, as much of the data deals with fictional representations and textual/content analyses. The ethical considerations for human actors playing roles in these fictions are addressed in Article I.

database becomes a means of gaining a big picture of how games and other creative works present machine vision. Because the lines between games and for instance electronic literature works or digital artworks are blurry, this allows the Machine Vision project to analyze and visualize the attitudes and representations on a broader scope without being limited to a particular definition of media types.

The database provides the data material for the in-depth analyses I conduct in my articles. In these analyses, I am concerned with the discord or concord between materialities and fictional representations insofar as they give insights into inherently messy cyborgian processes. I position my research as part of what Stephanie C. Jennings (2019) calls "cybernetic methods"; scholarly interventions where games and players are repositioned within transformative and dynamic configurations of human and non-human agencies. Reiterated, for this study, a fundamental assumption is that knowledge is constructed and situated (Haraway 1988), which means that objectivity is not feasible nor is it an aim. Another fundamental assumption is that games require deep entanglements between human and machine agents. I therefore gather and approach the data through conceptualizations of the posthuman (Haraway 1988; 1991; Hayles 1999; 2017; Braidotti 2013) as articulated in chapter 2.

3.2 Data collection

Data for the database was gathered intermittently between February 2019 and October 2021. A range of strategies were used to identify relevant games based on four selection criteria, explained in detail below. I used a mix of strategic sampling based on preexisting knowledge, systematic searches of existing game databases/stores such as Steam, snowball sampling (see e.g. Vogt and Johnson 2005), and input from the research field and social media, a methodology shared by the broader Machine Vision project (Rettberg et al. 2019). This allowed me to capture a wide array of representations of machine vision in games, from the mainstream to

more independent[11] approaches in 19 different countries[12] published between 1985 and 2020. The mix of these strategies ensures that the corpus does not rely solely on the individual researcher, algorithms that limit themselves to a certain distributor of games, or search engines with certain criteria in place.

To sample representations of machine vision in games, the games were selected based on several criteria. The criteria are as follows:

1. The game is digitally based
2. The game is marketed or presented as a "Game"
3. The game uses or represents at least one machine vision technology
4. The game thematizes this representation in its diegesis

In short, it must be a digital game that represents that and/or how a machine sees the world. Additionally, attempts were made at diversifying the corpus without it being a set criterion. Through focusing on diversity (including geographic spread, year published, genre, studio size, etc.) in the selection, I gather a rich sample without resorting to an exhaustive mapping of every single representation there is. In this, like Brendan Keogh (2018, 9), I move toward "account for *any* videogame work in its particular configuration of player-and-videogame, not a single configuration of player-and-videogame that is the same for *all* videogame works". Focusing on diversity means that games from the same series are registered with one representative title, under the assumption that titles in the same series are likely to be

[11] Often referred to as "indie games" which "differ from the mainstream – often featuring 'retro' aesthetics, small-scale development teams, digital-only distribution and alternative financing methods" (Lipkin 2022).

[12] The distribution is as follows: the US (23), Canada (9), Japan (7), the UK (7), France (6), Poland (3), Finland (2), Germany (2), Netherlands (2), Sweden (2), Australia (1), China (1), Croatia (1), Czechia (1), Denmark (1), Italy (1), Norway (1), Russia (1), Spain (1). In cases of international cooperation for larger titles, country was not attributed. This was only relevant in my study for Ubisoft (4). Additionally, there is one case where the developer's country was unlisted (1). These numbers are based on the country where a studio or an independent developer is primarily located (self-reported) and is intended as an indicator for geographic spread and diversity in the data and not as a point of analysis. Much game development is on an international scale and a geographic location or point of origin is hard, if not impossible, to determine.

similar in their representation of machine vision[13]. Such an approach gives rich qualitative data on the phenomenon studied without being too expansive.

There were several reasons for these criteria. Criterion 1 delineates the field of study to *digital* games, games that cannot function without the digital component and is experienced primarily through digital computing technologies. Such games, because of their screen-based mediality, are also machine vision in themselves. Thus, there is a dual level in the representation of machine vision. Criterion 1 excludes other forms of games like board games and tabletop or live-action role-playing games, as well as board games that have technical companion applications which result in a hybrid game form[14]. Criterion 2 opens for a diverse range of genre and game mechanics, which is necessary to capture different and distinctive responses to machine vision representations. This choice reflects my view of games and game studies as a multifaceted arena with lots yet to discover. This became evident as the criterion caused the sample to include some titles that I at first glance would not have considered, including games that are part of artist projects or similar to older narrative games in that they lack a clearly discernible navigable space. Criterion 3 identifies the research object (machine vision technologies) and the situation around it.

There were some unforeseen consequences to the combination of criteria 1, 2 and 3, namely maneuvering the proliferation of virtual reality (VR) and augmented reality (AR) as experienced by the player. Criterion 4 was introduced to regulate these uses of machine vision and to ensure that the research stays grounded in diegetic

[13] Which is an assumption to be challenged but deemed necessary to capture as broad a corpus as possible. Ubisoft's Assassin's Creed series alone could have been most of my data material, standing at twelve main titles and several spin-off titles at the time of writing. Choosing one representative title loses the distinction of influential works but also prevents influx of data when it comes to very large bodies of games in the same series. The development of machine vision thematization within a series is something I have noted for future research – e.g., how *Final Fantasy VII Remake* (Square Enix 2020) from 2020 uses holograms and surveillance cameras to a much greater degree to explain the events of the game than its 1997 predecessor does (see articles II-III).

[14] Diegetic machine vision in non-digital games exist, and an early version of the database included a board game example of machine vision: the character Psychologist's "oculobe drone" and "eye scanner" in *Nemesis* (Kwapiński 2018). However, a pragmatic approach necessitates the line be drawn somewhere. Considering that board games and digital games might have different ways of representing machine vision, and the amount of time spent to find, play, analyze, and log 77 *digital* games, the line was drawn there.

representations that the fictional world acknowledges and can interact with and around[15]. Diegetic machine vision means that it is narratively or aesthetically framed as part of and acknowledged in the fictional world of the player character. Note that this simplification is drawn for analytical purposes and should not be viewed as strict categories but as points in a continuum from fictional content via game machine to player.

Games that *use* technologies such as VR and AR as part of their playable interface were included in the dataset if machine vision technologies were presented diegetically[16]. The reason for this extra layer is of both a scientific and practical nature; collecting all games that use only VR would inflate the data with similar actions and agents and would be a research project in itself. The researcher on digital artworks experienced the same problem with these technologies that read and respond directly to the player/user. Together we decided to require diegetic machine vision in these instances as well as the actual machine vision interface the player uses – for games and artworks alike. This means that VR and AR is considered on par with a game controller or a keyboard and mouse unless criterion (4) is fulfilled. The same strategy was used for games where exposing the player's body to motion tracking is a prominent game mechanic. The need for such a strategy indicates that machine vision as playable interface is becoming increasingly common.

Incidentally, criterion 4 on diegetic representation also helps identify a technology as machine vision. As an example, the action game *The Legend of Zelda: Twilight Princess* (Nintendo 2006) has a mini boss that is a holographic representation of a

[15] Which is perceived by the player as intentional design; that the existence and prominence of such elements guarantee that they are there and designed that way for a reason (Van de Mosselaer and Gualeni 2020).

[16] Some games that draws attention to their mediating machine vision technology interface were included even if this was not explicitly diegetic because their genres lack a strong narrative framing like many of the adventure games do. This is a remnant from the Machine Vision project's separation between *represented* and *used* machine vision and accounts for 8 of the 77 games. The games are *Don't Look* (Don't Look Team 2019), *Before Your Eyes* (GoodbyeWorld Games 2021), *Emotion Hero* (van de Ven 2016), *Face Your Feelings* (PlayGen Ltd 2017) and *Just Dance 2019* (Ubisoft 2018), *Pokémon Go* (Niantic 2016), *The Walking Dead: Our World* (Next Games 2018), and *TendAR* (Tender Claws 2018).

character. In the diegetic framing of the game, it is explained as a magical hologram and not a technical one and is therefore not included in the corpus. Similarly, the strategy game *Sid Meier's Civilization VI* (Firaxis Games 2016) allows the player to launch a satellite that reveals the entire player map of the world and not just areas where there are player units, cities, or diplomatic allies. However, this presentation is not explicitly thematized as machine vision; we do not see through the satellites or otherwise receive explanations for the new overview, but they are indeed catalysts in the map's creation. The replay function of goals in contemporary soccer games also fails to provide a narrative framing for the expanded player view. Such expanded player views are a potential direction for further research but falls outside the scope of gathering the dataset for machine vision characteristics due to criterion 4.

Many games were only suspected of meeting the selection criteria and had to be played to confirm or refute their inclusion in the final corpus. The final corpus for my dissertation is based on findings from 77 games that feature machine vision technologies[17]. Although the database does not register subgenres of games, the majority of these are single player adventure, action, or role-playing games with visual virtual environments, although multiplayer and text-based games are also included.

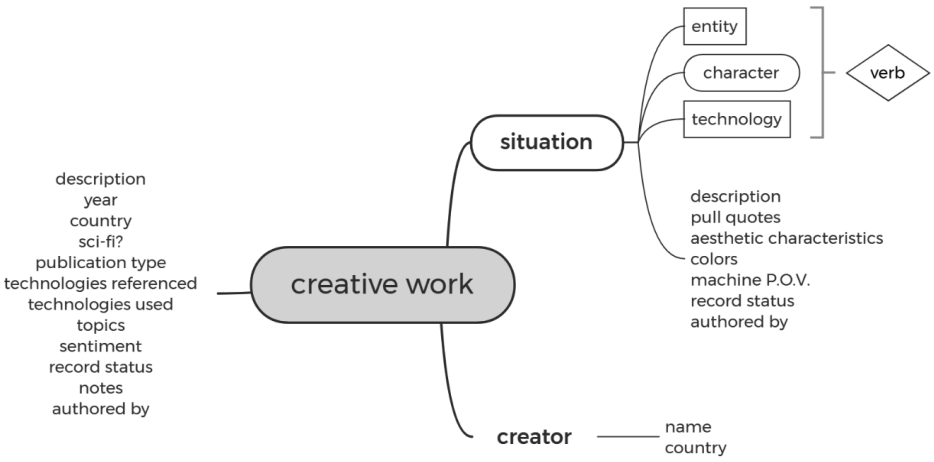
3.3 Database and analysis model

A large part of this dissertation's work and contribution is based on the database constructed as part of the Machine Vision project. To understand the present study, it is important to understand how this database infrastructure has been used as an analytical tool as well as a data repository, and how the Machine Vision project team

[17] This number is based on the Machine Vision database. Seven games with machine vision were gathered and analyzed for Article III that are not in the database because attempts were made at diversifying machine vision representations in the database. These games are therefore not included in the number 77: *Metal Gear* (Konami 1987), *Goldeneye 007* (Rare 1997), *Bioshock* (2K Boston 2007), *Mirror's Edge* (EA DICE 2008), *Sleeping Dogs* (United Front Games 2012), *Monstrum* (Team Junkfish 2015), *Among Us* (InnerSloth LLC 2018).

has worked collaboratively to shape its structure. This section presents the database structure and its implications for my study.

The Machine Vision database (Rettberg et al. 2021) documents uses and representations of machine vision in games, artworks, and narratives, collectively referred to as "creative works". The database consists of 500 creative works: 77 games, 190 artworks, and 233 narratives, the latter including films, electronic literature, novels, and more[18]. The data found within is the project team's interpretative analysis data. A detailed explanation of the database and its data can be found in Article I, but aspects that are important to understand the following pages are summarized in figure 3.



3: The Machine Vision database structure and analysis model

A *creative work* is registered with various metadata (publication type, title, year published, creator, country of origin) as well as technologies referenced and/or used (fixed vocabulary), important topics raised (fixed vocabulary), sentiment towards machine vision presented in the work (fixed vocabulary), and a general description of the work.

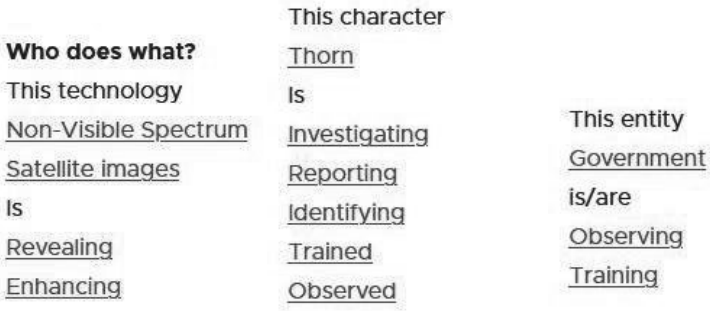
[18] The project team decided to simplify data by allocating one publication type identifier to each creative work. Clear lines of demarcation between games, artworks, and narratives might appear reductive and hides that a work can belong in more than one domain but avoids inflating media type categories until they are no longer valid as descriptive types.

For creative works the project team created sublevels called *situations*. Situations are a level of data analysis created to capture the granularity of agents and actions when machine vision technologies are present, which is needed to answer my research question. In a situation, there is information about agents – characters, technologies, and entities – that act or are acted upon in relation to machine vision, and what they do (open vocabulary)[19]. Data is also gathered on aesthetic characteristics and colors (open vocabulary) of a given situation, and whether the point of view is located with the machine vision technology (Boolean determinator).

One creative work can have multiple situations. For instance, in the adventure game *Spycraft* (Activision 1996) I identify two prominent situations: "Image analysis with satellite and infrared" and "Killing hostiles with night vision". Having two situations for *Spycraft* captures not just that there are multiple technologies present (non-visible spectrum and satellite images) but *how* they are used *by whom*. In the former situation, the player character Thorn compares satellite images with infrared data to identify the number of active hostile tanks in an area. In the latter situation, night vision technology enables Thorn to see enemies so he can shoot them. In both situations, the machine vision technology is revealing and identifying, but one is used for investigation and report and the other for killing. This difference, I and the project team posit, matters for the machine vision technology's overall representation in the virtual environment. *Spycraft*'s example shows that capturing situations as units of analysis allows for multiple and possibly contrasting representations of machine vision within the same creative work, which builds towards the identification of tensions in machine vision in games (chapter 5). For games, it specifically isolates the situation (agents and actions) instead of the creative work (medium/genre) as the most important part to answer my research question.

[19] In total, my corpus consists of 1726 actions taken by game agents.

4: Situation agents and their actions in Spycraft*: Image analysis with satellite and infrared*



5: Situation agents and their actions in Spycraft*: Killing hostiles with night vision*

Finally, the concept of *character* as its own sublevel allows for preserving intersectional identities for the agents these creative works represent. A character as a unit of data analysis is created when an agent has two or more observable or described traits. A character is registered with presented name, age, species, sexuality, gender, race/ethnicity, whether they are an individual or a group with similar traits, and if traits are customizable (a unit introduced because of some player characters in games that allow the player to choose e.g. gender presentation). The example of Thorn from *Spycraft* is a non-customizable adult human male of unknown sexuality and race/ethnicity (see figure 6).

Age: Adult

Species: Human

Sexuality: Unknown

Gender: Male

Race/ethnicity: Unknown

Individual or group?: Individual

Customizable?: Not customisable

Works the character appears in

Title	Publication Type	Year
Spycraft	Game	1996

Situations the character appears in

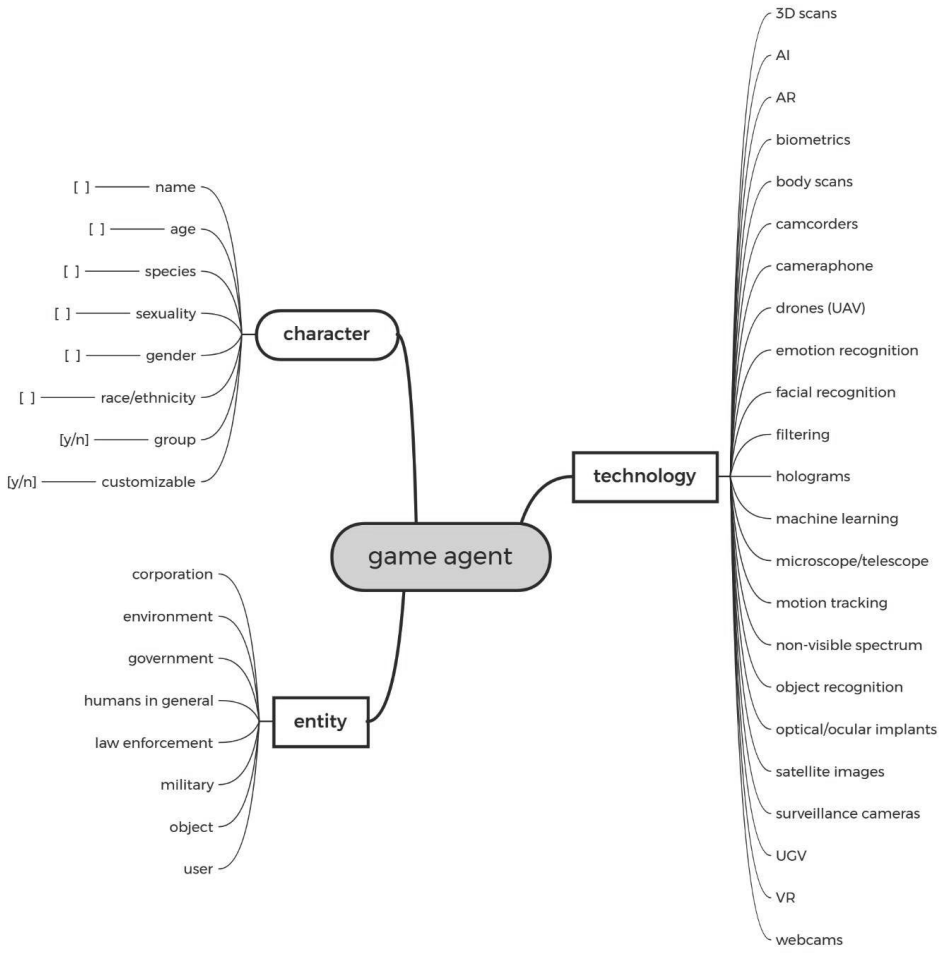
Spycraft (Image analysis with satellite and infrared)

Spycraft (Killing hostiles with night vision)

6: Character traits for Thorn from Spycraft

Throughout the project, discussions have centered on how much data we should include for these representations, minding especially the risk of reducing representations to stereotypes (Rettberg et al. 2019). However, since the project is interested in analyzing bias and marginalization, we settled on capturing data on *presented* gender, age, race/ethnicity, sexuality, and species. The ethical considerations for assigning such traits to characters are discussed in Article I. Character fields are listed as unknown/not applicable if there is no presented data available. This is done to avoid assigning traits where there is no presentation, and incidentally shows that a category can be useful even if it does not apply to all creative works.

Other agents besides characters are *entities* – created to capture institutional interests and power rather than the traits of characters – and the *technologies* themselves. In total, my corpus consists of 164 agents (133 characters, 23 technologies, 8 entities), shown in relation to each other in figure 7.



7: Game agent structure

Evidently, the method of analysis described here depends on the expertise, assessment, and partial perspective of an independent researcher; however, attempts were made at strengthening inter-rater reliability through collaborative effort in creating a coding list. Discussions revealed cultural definitions from and for the purpose of the project which were gathered in the GitHub Wiki "Database guide". Many definitions were created early in the project and then adapted as we found data material that challenged them (which then were changed in the database entries already made). Moreover, because of the project team's close collaboration in a

shared office environment pre-pandemic, I could easily ask questions like these in the office space:

> *Would you say security guards in a corporation-run totalitarian facility are "law enforcement", "corporation", or "government"?*
>
> *What verb would you use for a hostile takeover by an AI of a body?*
>
> *Is Cortana from Halo white even if she's blue?*
>
> *How would you assign traits to these 8-bit characters?*

During the Covid-19 pandemic lockdown, such discussions were had on the project team's Discord channel. Additionally, select games (as well as other creative works) were played by more than one researcher who would then verify or discuss parts of an analysis for that game. This was to ensure that the method of coding was implemented as similarly as possible while still acknowledging individual and situated experiences. In the database structure, in Discord, and in GitHub, the project team could open "issues" for analysis entries that we wanted assistance with, which were resolved before freezing the database in October 2021.

Once the corpus was finalized and logged in the Machine Vision database, data was exported in comma-separated (.csv) files and posted to a data repository in GitHub. From there, the datasets could be imported into Microsoft Office Excel, which sorts .csv files into cells based on the information they contain. After merging and cleaning the relevant data exports, this information was copied into a new Excel file with separate sheets for edges and nodes; information needed to form adjacency tables for data visualizations in the network analysis software Gephi. Gephi was originally intended as a final visualization of specific kinds of networks in the corpus, but I mostly used it for exploratory purposes in revealing interesting connections that could be explored in-depth later[20]. Playing with the data visualizations (also a case of

[20] In Gephi, I clustered nodes with stronger connections using the *ForceAtlas2* algorithm. Most often, there would not be clear hubs between nodes, indicating that the networks were relatively balanced, although some agents and actions had more connections than others. I filtered based on the number of edges between nodes using the Query *DegreeRange*. This hides nodes and edges with less than the specified number of edges, for example removing those nodes with only one edge connection.

machine vision) enabled me to think through the data in a different way than with just the numerical values alone. In the process of visualizing data, an overreaching aspect stood out: the quantitative analyses, albeit revealing tendencies, could not aptly explain what I found to be the most salient parts of my study. At this stage, I therefore decided to make Article IV, originally intended to be a quantitative data visualization article[21], into a qualitative close reading.

The collection of data involved several challenges that could affect my results. First, even with attempts at broadening the scope as much as possible beyond the country this research has been conducted in (Norway), the distribution inclines towards North American, European, and East Asian representations of machine vision. The situatedness of the researcher and the structure of methods such as snowball sampling undoubtedly influence this. Therefore, the analyses will be limited to the platforms, genres, and regionality of the 77-game corpus. Second, although some games were played by two or more researchers, many were not, which sometimes made discussions of database entries challenging. Third, questions such as "what verb would you use here?" indicate that the coding schema for verbs, albeit an open vocabulary, still restricted data input. The translation from the experienced action into active and passive verbs can, however, be seen as a coding of the data. Additionally, the attempt to capture representations of machine vision across different media led to losses and gains in terms of how to structure the database, minding that the structure of the database would inform the data it would yield. Last, the coding schema had the

Running a *Modularity* filter algorithm and coloring nodes according to modularity group was also done to find nodes that are more connected to each other than to the rest of the network, and a *Betweenness Centrality* algorithm determined how many edges have their fastest travel connection through a given node junction.

[21] I originally conceptualized Article IV as on the data from the database, following a structure like e.g. Emma Reay's (2021) overview of the representation and function of children characters in games – just replace children with machine vision. Perhaps this can be done based on my data in the future.

unforeseen and unfortunate consequence of sometimes having to weigh components of intersectional identities in deciding what was the most salient part (Shaw 2018)[22].

Nevertheless, the coding schema in the database allows for capturing granular details of machine vision representations and analyzing cross-genre connections between characteristics of creative works. It is an analysis model based on textual analysis (where text refers to a site of meaning rather than the material object) that focuses on individual situations where machine vision is represented. Its exploratory and iterative construction follows a combination of inductive and deductive coding. Combined, the database is both an analytical tool and an archive of the results of the process of analysis.

3.4 Textual analysis of games

To further analyze the characteristics of machine vision and the human-machine relations that arise when machine vision is diegetically present, specific games in the database were selected for in-depth qualitative analyses. This was deemed necessary to address the research question because granular details were lost in coding and distant reading of the games. Additionally, the database presents tendencies across games, but one game could have a vastly different depiction of machine vision than another and these will still show up as equal in a network analysis. Therefore, selected titles were chosen for close readings using critical feminist and posthuman perspectives as analytical lenses. These close readings are seen in articles II-IV.

The games I chose for close readings are major (AAA) titles that are influential in marketing and reach and expected to have a wide societal impact: *Horizon Zero Dawn* (Guerrilla Games 2017), *Final Fantasy VII Remake* (Square Enix 2020), *Watch*

[22] For instance, because gender representations and machine agents are deemed more important for my research question, I decided to analyze a situation where representatives from two different corporations watch a hologram as a group character instead of an entity. This meant losing them in the analysis of "what do corporations do in these situations" but gaining them in analyses of gender ("here are a dozen white men staring at a hologram of a woman"). Similarly, robotic animals were logged as "species: machine", which means that they do not show up in inquiries into "species: animal".

Dogs: Legion (Ubisoft Toronto 2020), *Call of Duty 4: Modern Warfare* (Infinity Ward 2007), and *Cyberpunk 2077* (CD Projekt Red 2020). The focus on AAA games was necessary to examine how machine vision can be experienced in everyday life – and these influential games reach many people in their everyday lives. In order to be able to comment on issues of diversity and inclusion, I made sure to include lesser-known, smaller (in terms of production team size), and peripheral or marginalized games whenever applicable. Moreover, these five games have players pursue narrative and ludic mastery, a pursuit that valorizes player agency but also requires computational and non-human agency to succeed (Gallagher 2022). As such, they explicitly present the tensions of embodiment and agency that I investigate, which makes them well-suited for exemplifying human-machine relations on several levels.

For the aesthetic representations of machine vision technologies that are the fundaments of this research, methodological assessments in my research are similar to those for depictions in literary and film analyses. Aesthetic representations of objects in games can be duplicated in other media and analyzed on a presentational level, and methodologies from other media will therefore mostly provide the tools needed for this kind of analysis. Although my analytical focus primarily resides with visual components, the overall representation of these components is also informed and influenced by other sensory inputs, like the understanding of touch and sound (e.g. Jørgensen 2017; Keogh 2018). As Frans Mäyrä (2015, xii) notes, we should not reinvent the wheel for research methodologies when the aspect of the game or gaming culture we are researching has valid approaches in other disciplines, however, we need to actively assess and adapt the methodologies to the "unique characteristics of games and play". In other words, to answer my research question of *What characterizes machine vision in games, and how are human-machine relations explored through machine vision in games?* I had to adjust the spokes to better fit the wheel.

My use of textual analysis builds on the understanding that "text" is not a material object but a site of meaning. Referring to games as texts open for the use of textual analysis (Carr 2009; Cole and Barker 2021, 1). I draw from N. Katherine Hayles

(1999) to understand texts as embodied, and Diane Carr (2009; 2019) to understand textual analysis of games as a broad model of textuality that incorporates practice and allows for "exploring the relationship between text and play" (Carr 2009). Textual analysis of games in this perspective acknowledges that games represent through bodies (Keogh 2018).

Because of the close connection of form and content in games, the human and machine entanglements of playing a game necessitate an understanding of the researcher as embodied. Coming from a posthuman perspective, I therefore consider it necessary that a textual analysis methodology is transparent about the *experience* of games as contextually and situationally dependent. Such transparency will help develop the awareness of the position from which I play and how it shapes knowledge production, following Donna Haraway's (1988) approach of situated knowledges (see chapter 2). As such, section 3.5 is a contribution to critical analyses of the situated play of games (Jennings 2018, 160).

Carr's (2019) review of literature on game methodologies exemplifies that there are concerns with applying analytical methods created for other media to games. This concern especially relates to game rules and to texts that are played. Games can be played, replayed, played differently, recorded and watched (but not playable), and vary in choices and events, which makes Carr question "the kinds of choices that make analysis possible at all". Indeed, limitations for textual analysis of games include that they can be time consuming (as my hundreds of hours of play prove) and that they can halt both play and analysis. The latter Carr aptly phrases as "the potential for the role of the player-as-analyst to blur into the role of the sort-of-player-as-earnest-yet-thwarted-archivist". Moreover, Carr notes that there is also reason to critically evaluate whether this application of fragmentation will be the same for different kinds of games.

The overall worry is selective omission (Carr 2019). I would emphasize that this is not new to the study of any cultural artefact, be it games or otherwise. The variabilities of games do not mean that there is no common ground. As I have

mentioned, through a posthuman lens such variability can be generative. In other words, the situated and distributed experience of playing the game highlights how all knowledge and perception is situated and distributed, which allows for connected and disconnected strands of individual experience. As Daniel Golding (2013, 30) explains, there is a tendency in textual analyses of games to apply a holistic, totalizing, and unhindered vision to the player, a tendency which treats the medium as an isolatory object. Keeping Carr's and Golding's remarks in mind, the next section explains the inclusions and omissions in my research context.

3.5 Playing research

When I research, I play. This simple sentence has been the cause of several confused and even distressed discussants, because for some, "play" and "research" are singular and oppositional entities of meaning. Indeed, what Carr (2019) identifies as a "sort-of-player-as-earnest-yet-thwarted-archivist" hints at such a division. This section shows how I play and research through elaborating on my process of data collection and analysis.

I conceptualize play and research as parts of the same process. As a game scholar performing textual analyses of games, I am an active part of what I research. For game studies research that is interested in representation the way that mine is, the embodied experience of the game is a vital source of information. This builds on the idea of the phenomenologically embodied player (Vella 2015; Keogh 2018). A player is never completely in the game nor are they completely outside. For Daniel Vella (2015, 71), this means that "the player does not entirely 'disappear' into the ludic subject-position: she retains her external standpoint as a player engaging with a game artifact, being, in the act of playing, both ludic subject *and* player". Players are put in this dual position regardless of their status as researchers. Note that playing here involves hearing, reading, feeling, and seeing, in addition to controlling, moving, and deciding – and that there is a receptive component to these actions as well.

Introducing an analytical framework into the activity of playing a game is not a radical shift in the play activity. Game analysis is not something only scholars do, because playing a game often means having an analytical approach in order to progress (Aarseth 2003). It is an ongoing process of informing heuristic interpretation (Arsenault and Perron 2009). Players do this naturally to learn how a particular game is played. Thus, the role of playing *and* researching is already present. The combination of these perspectives is just emphasized and increased in complexity due to the formal role of the researcher. For my research, this exemplifies how human-machine relations in assemblages fluctuate with the agents therein, and that individual agents are not static entities.

One way of accounting for my fundamentally embodied research is to acknowledge that there are insights gained and missed from being in the position of a female player, insights into certain power dynamics that might be visible or hidden to other positions[23]. Another way of accounting is to include experienced content, or *how* I play. Focusing on reflexivity and situatedness shows "how the researcher is culturally and locally involved in her quasi-object of study through play" and "the physical locality of playing whilst still relating play to a more global or national context" (Lammes 2007). I subscribe to Sybille Lammes' (2007) argument that player type typologies (Bartle 1996; Aarseth 2003; Kallio, Mäyrä, and Kirsikka 2011) prove restrictive because they do not account for cultural differences in approaching games or contextual factors of experiencing content. However, because I am an avid player of many types of games, I believe I approach them differently than would someone who has recently begun to play or have little interest in them outside of an academic setting (see e.g., Schmierbach 2009, on variance in content based on player experience). Because of my close familiarity with the medium and practices at hand, I

[23] Importantly, the marginalized position as a woman in patriarchal culture (Jennings 2018, 160) does not translate to a universal voice for female players, and this marginalized position is troubled by other parts of my position, for instance my role as a games researcher. Identity is complex, intersectional, and always contextual.

would refer to myself as a gamer-researcher[24], following Kristine Ask's (2016, 100) example. Preexisting knowledge of genres, tropes, challenges, and controls ("gaming literacies" in Gee 2003) will undoubtedly influence my analyses because my analytical and playful perspectives are thoroughly intertwined.

My methodological account of how I play acknowledges that approaches, interpretations, and choices in play are unique for player and context. Espen Aarseth (2003) calls this a "playing analysis", Olli Tapio Leino (2012) the "finitudes" of play. Because games often allow for some sort of navigational or interactional experience of aesthetic representations (with direct feedback from the system), our understandings of these representations vary. Moreover, games can afford diverging and sometimes excluding paths, or "more than one way of 'playing well'" (Leino 2012), which could also lead to changes in representation. According to Vella (2017), a player is an active being "and action is its mode of engagement with the gameworld". Because this dissertation focuses on actions performed by different agents, I, as a player, am one of the agents whose actions are under scrutiny. Therefore, I supplement textual analyses with details inspired by ethnographical reflections on research processes, to be as clear as possible with regards to the contextuality of my research.

To exemplify, in the data collection process, I played until I encountered a machine vision technology. I would then play through the situation surrounding the technology and write field notes with pen and paper about details such as visuals, text, and actions. If the game allowed it in terms of pace and control, I would also capture a screenshot. The field notes and screenshots answer questions such as which agents are present; what they are doing in regard to the machine vision technology; how they are depicted; what can be deemed in terms of power relations between agents; from which perspective is this experienced for the player; etc. However, the only pre-determined observation questions were to find which agents are present in a machine

[24] Gamer is a conflicted term, often associated with prohibition and gate-keeping (Deshbandhu 2020). I use it here as what I think it always should have been; a self-identifying term instead of an exclusory categorical tag to put on (some but not all) others.

vision situation and what are they doing in relation to each other – information needed to answer my research question. Other details were informed by the specific situation as I encountered it. My initial analyses were shaped by my focus on machine vision technologies, but beyond this I aimed for experiencing the situation as it emerged. The initial analyses were then later supported by in-depth analyses. Contextual elements and play style informed the analyses in every step.

To communicate the qualities of my played research, excerpts of my field notes from playing the action game *Watch Dogs: Legion* (Ubisoft Toronto 2020) can be of assistance. The excerpt mentions several agents and actions and are copied to digital text below.

> *facial rec., hologram statue, autonomous drones UAV killing, Bagley hologram AI, hijack cameras, zero-day hologram for drones -> shot*
>
> *Dalton threatened killed, Sabine Brandt, private company Albion gov't sanctioned, Sally Fitzsimmons novelist, former cartographer*
>
> *disguised and broadcasted w/holo*
>
> *operative AR cloak/shroud -> target*
>
> *hiding using masks -> "advanced tech"*
>
> *camera/phone, selfie filter!*
>
> *Blume's optik -> AR eye implant, passport, mandatory (state) bypassed by dedsec, biometrics "id checks are mandatory"*
>
> *reconstructive AR analysis*

The notes also describe thoughts on the sentiment and tone of the work as it was experienced, incidentally showing that a researcher is not always focused on the research question at hand:

> *NPC "I doubt we would've woken up without you giving us the kick in the arse we needed. Thanks, Dedsec."*
>
> *mood: why sci-fi when future's scary enough*
>
> *streetart "nice to beat you" (police and kid)*

anthropom. Bagley: said fuck

blue

player power? enabled/required/constrained, "decide skye larsen's fate"

The field notes are supplemented with screenshots from the virtual environment, including stills from complex assemblages of agents but also promotional posters for in-game companies using machine vision in policing. Such field notes might be hard to decipher for an outsider but helped immensely in analyzing and entering the creative work into the database, and further for the in-depth analysis of surveillance representations in Article III.

After data collection and preliminary analyses were ready, I followed the structure of the Machine Vision database (as explained in section 3.3). In this work, I would expand upon my field notes using the prompts that the database gives. Most often, this entry would be started on the same day as I finished playing the game. I used the database's prompts as an analytical tool to generate further understanding of the data material. For instance, from the identification of sixteen different machine vision technologies in *Watch Dogs: Legion*, I found six prominent situations. These are recurring scenes of importance to the game's narrative and mechanics, such as reconstructing and analyzing AR data or hacking into the city's surveillance network, but it also includes the very first mission the player is set upon, which notably combines several key technologies into a dramatic backstory for the game. Many scenes involve multiple technologies working together, which was easier to see in the analysis after playing than it was mid-play.

In total, my data material comprises situations from hundreds of hours of playing research on different consoles in both the office and the home office. Faced with the challenge of many games clocking in at 20-40 hours for just completing the main story, I had to prioritize my time. Because my research is focused on machine vision situations, I do not necessarily have to finish the game, but I must get a good overview to see what its general topics are and identify specific situations where machine vision technologies play a part. Inspired by concerns about the extent of

representative data in quantitative and qualitative analyses of games (Aarseth 2003; Schmierbach 2009; Consalvo 2013) and Ea Christina Willumsen's (2021, 67–68) "gameplay log", my field notes were used to create a self-assessed play log (see figure 8 for a summary and the appendix for the complete log).

The play log is a transparent way of communicating how each game was played, for how long, and using what. It does not indicate that less time equals less valid data – only that there might be thematizations not accounted for, for example due to time management, technical issues[25] or lack of access[26]. Willumsen explains that her framework is adapted from Aarseth's (2003) seven "stratas of play": superficial play, light play, partial completion, total completion, repeated play, expert play. Willumsen also adds "innovative play". My adaptation of Willumsen's (2021) framework contains the following types of play: superficial play, light play, partial completion, total completion, repeated play, and non-playing analysis. My adaptation of Willumsen's framework does not include "expert play" and "innovative play", as I do not need the distinction for the kind of analysis I perform. Instead, I added "non-playing analysis" (Aarseth 2003), which has secondary sources.

[25] *AI: The Somnium Files* (Chunsoft 2019) and *Manhunt* (Rockstar North 2003) had software issues causing them to crash at a certain point in the Windows edition. I jokingly referred to the latter's as "divine intervention" in the project team's Discord channel because of the increasingly unpleasant violent depictions in the game (it was and still is a notorious game). See non-voiced walkthrough video at: youtube.com/c/NoireBlue for *AI: The Somnium Files*, accessed medio 2021.

[26] *Lifeline* (Sony Computer Entertainment Japan 2003) and *Surveillance Kanshisha* (Sony Computer Entertainment Japan 2002), two older Japanese PlayStation 2 games that were hard to get a hold of due to the Covid-19 pandemic lockdown. Non-voiced (voiced for *Lifeline* because it is played using audio prompts) YouTube playthroughs were used as the basis for my own content-based analysis supplemented with external analysis of the player's diegetic movement. My non-playing analyses are "partial completion" in terms of narrative progression. See walkthrough videos at: youtube.com/c/Lacry for *Lifeline*, accessed early 2021; and youtube.com/user/DorohnL and youtube.com/channel/UCOSofdCI_eNskFZtjdM9R7g for *Surveillance Kanshisha*, both accessed medio 2021.

Type of play	Description summary, based on Willumsen (2021, 67–68) and Aarseth (2003)	Number of games	Percentage of corpus
Superficial play	Quick assessment without developing understanding e.g. structural features	0	0 %
Light play	Some meaningful progress and stopping thereafter	11	14 %
Partial completion	Reaching a series of sub-goals	25	32 %
Total completion	Playing the game to where the main content (often narrative) ends	35	45 %
Repeated play	Several playthroughs of the same game	3	4 %
Non-playing analysis	Secondary source of play	3	4 %

8: Summary of the play log

In one case, paratextual sources were consulted to allow for continued play[27]. I consider this use of a community-based paratextual resource – a walkthrough – as exemplifying Leino's (2012) argument that instead of interpreting the "essence" and authorial intentions of a game, scholars of game design should study the material artifact as it exists, unless otherwise specified. A researcher's encounter with a game, even if it involves not being able to progress as it did in my case, must accept experienced phenomena as features of the game, "however unpleasant it might be" (Leino 2012). My focus on the paratextual resource in this situation also highlights a certain hegemony of the game over broader game-related phenomena.

[27] Time or software was not the issue, but I was. I struggled for a long time figuring out how to solve several of the puzzles in the adventure game *Whispers of a Machine* (Raw Fury 2019), not because I did not know *what* to do, but because I did not know *how*. There was one case where the cyborg detective I played had to get access to the apartment of a suspect in a murder case. The solution to unlocking the front door keypad involves a trip to the morgue, creating a replica of a dead person's finger using previously (hard-earned) tools, finding a code out of hints in two different texts from different parts of the city, and finally using the replicated fingerprint on the keypad scanner. In a point-and-click adventure game such as this, it was easy to figure out that I needed the dead person's fingerprint, but finding the required tools proved difficult. Consulting the walkthrough showed that instead of making a replica fingerprint, I could have just cut off the deceased's finger, which did not occur to me. See neoseeker.com/whispers-of-a-machine/walkthrough for the walkthrough in question (accessed December 8, 2020).

Summarizing, the research question influenced how I played and analyzed the games. Even if a player and a researcher can be similar in how they play and analyze games, my research question meant that I included new types of games I would not have considered before, stopping for field notes as I played, accepting the situatedness of my player role, and also that I did not finish playing all the games to their logical end. The interplay between the two methodological approaches gives a broad overview and detailed insights. The quantitative nature shows different representations of machine vision in games and presents enough data to outline certain tropes in these representations. The qualitative nature yields further insights into how the specifics of these representations come to play. The mixed methods study is aptly suited for a digital humanities project such as this. Challenges in reconciling different types of data was ultimately a tension point in itself that forced new ways to think about the delineations of this data.

4. Summary of the articles

This chapter presents the four papers in the dissertation that, together with this synopsis, answers the research question: *What characterizes machine vision in games, and how are human-machine relations explored through machine vision in games?* As the previous chapters have detailed, these articles are underpinned by a posthuman approach to the analysis of games using qualitative and quantitative methods. They demonstrate that machine vision in games is characterized by a double-orientedness that caters to the fictional world and to the player-and-game relationship, which shows that vision is always mediated, partial, and embodied.

Article I: "Representations of Machine Vision Technologies in Artworks, Games and Narratives: A Dataset" (Rettberg, Kronman, Solberg, Gunderson, Bjørklund, Stokkedal, Jacob, de Seta, and Markham, 2022)

Article I contributes with a dataset that gives a broad overview on how machine vision technologies are imagined in the in the cultural discourses of games, art, and narratives. Therefore, Article I documents the empirical groundwork that is the foundation of articles II-IV in this dissertation. The dataset includes 500 creative works (the 77 games of this dissertation as well as digital artworks, films, novels, electronic literature, and other narratives) with descriptions of the relationships between machine vision technologies and characters/other agents in these creative works. The broad sample combined with granular details is needed to answer my overall research question on characteristics of machine vision and its relation to other agents.

Article I is a data paper, which means that its purpose is to describe data, in this case the dataset in the Machine Vision database. More specifically, it is a digital humanities article, which does not follow traditional formats for articles in the humanities. The dataset is provided as open-sourced comma-separated (.csv) files and includes R codes and linked data such as Wikidata IDs where applicable. Filtered data is presented in graphs detailing for instance the year and country of publication

for these creative works, but data is also available as raw data for further research. Suggestions for further research using this data is outlined in section 6.2.

Methodologically, the article contributes to discussions on mixed methods in media studies and game studies research. As the data is secondary data based on qualitative analyses by the Machine Vision project team, I have included an appendix to this synopsis which explains individual contributions in the Machine Vision project. An account of the Machine Vision team's iterative process of data collection and data analysis follows the presentation of the data. The article thus documents methodological considerations of mitigating bias in binary systems and ethical considerations of representations of characters in addition to the database's contents. The challenge of categorical compilation of rich qualitative data is the first point of tension in my research and lays the groundwork for my subsequent research.

Article II: "Holograms in the borderlands: Non-human presence and agency in games" (Solberg 2021)

My first solo-authored article investigates a recurring point of tension I found while playing and analyzing games for the database. Through textual analysis, this article answers the subquestion *Which aesthetic, narrative, and* mechanical *functions does machine vision have in games?* The article examines the role of holograms in games as non-player characters or objects whose aesthetics, narratives, and functions establish them as in the borderlands between digital and organic existences. This positioning, I argue, complicates binary views of presence and agency in games. It shows how machines and humans are interconnected rather than divided, and how non-player characters can have the same functions as player characters.

The article begins by situating holograms in a larger cultural and historical context. To illustrate the variations of hologram presentations in games, I build on 24 games where diegetic holograms are thematized to identify the roles of futuristic embellishment, navigation tool, communication tool, embodiment of AI, memory, and clone. To complement these differences between how games represent holograms, I perform a close reading of holograms in the role-playing game *Horizon*

Zero Dawn (Guerrilla Games 2017) through posthuman conceptualizations of the relationship between machines and humans. The analysis develops an understanding of non-humans such as holograms as agents and human-machine relationships as distributed assemblages. I conclude the article with pointing toward hegemonic discourses surrounding agency in games, showing that the hologram's hybrid existence becomes a gateway for untangling the complexities therein.

In Article II, I also begin to unpack how relationships between player characters and diegetic machine vision is reflected in the relationship between player and game. It solidifies that the diegesis of a game is on a continuum because my embodiment is an active part in how the game expresses its content.

Article III: "(Always) Playing the Camera: Cyborg Vision and Embodied Surveillance in Digital Games" (Solberg 2022)

Article III further develops the mirroring effect between diegetic machine vision/player character and game/player through investigations of another recurring trope of machine vision in games – surveillance cameras – and their thematized mediating function. Using textual analysis, the article answers the subquestion *How do games reconcile the relationship between agents when the interface is thematized as machine vision?* Its main contribution is examining the way games allow us to think and play with cameras as a simultaneously human and non-human vision which, I argue, can be understood through the concept of cyborg vision. Cyborg vision is a concept to account for a synchronized human-technical vision that is pluralistic and situated. It builds on Donna Haraway's (1991) idea of the cyborg to place disembodied technical views and perspectives back into embodied forms.

As such, Article III illustrates how vision is always mediated and embodied. The article contributes to surveillance studies by addressing a gap in existing literature on game representations, but also speaks to broader game studies research on camera interfaces and controlled visions. The empirical base explores the close connection between form and function for camera views in 41 games that depict surveillance cameras. A close focus is kept on the metaphor of the camera in game history and

how it connects to design and programming challenges. Through a comparative analysis of two games from the database, the role-playing game *Final Fantasy VII Remake* (Square Enix 2020) and the action game *Watch Dogs: Legion* (Ubisoft Toronto 2020), I apply the concept of cyborg vision to illustrate how it can be generative in understanding agencies and power relations for games and surveillance alike. Moreover, the article shows how any observer is both enabled and limited by their context, as possible actions are structured around camera representations. Thus, cyborg vision also includes the player of a game because players already inhabit such partial mediated visions.

Article IV: "'Too easy' or 'too much'? (Re)imagining Protagonistic Empowerment through Machine Vision in Video Games"

Articles I-III establish that games are distributed phenomena between human and non-human agents, and articles II and III illustrate how the line of demarcation we impose upon the player and game relationship is tenuous at best. Article IV examines the subquestion *How is agency distributed in games where machine vision is about domination and mastery?* using textual analysis. Consolidating research from the other articles, Article IV focuses on the history of connecting vision to domination and mastery through agency in games and how machine agency complicates this tradition. In other words, the article demonstrates not just that we relate to machine agents and agency but how this relation plays out. I argue that understanding agency as shared with machines both enables and complicates fantasies of dominance in games.

To do this, I build on posthuman game scholars' theorization of agency in assemblages, especially the concept of agentic modality (Jennings 2022) and scholarship on glitches (Janik 2017) and apply this to close readings of the action game *Call of Duty 4: Modern Warfare* (Infinity Ward 2007) and the role-playing game *Cyberpunk 2077* (CD Projekt Red 2020). Through the analyses, I show that assemblages helps understand the oscillation between human and machine agency as interdependent instead of isolatory, but that these are often hidden under games'

emphasis on player agency. Assemblages explain how there can be power disparities between agents but also how these fluctuate between embodied agents. Phrased differently, privileged and empowered machine vision perspectives are complicated when machine agencies are shown to be at odds with human vision. When the technology is not performing how we expect it to it is easier to find its agential interference. Here, machine vision can be at odds with human vision. In such cases, players are reminded of how our agency is situated as part of an assemblage. The article contributes with understanding agency as a relational phenomenon and not inherent to an agent, which reconceptualizes this to a collaborative and distributed practice of oscillating agential relations. It also demonstrates how machine vision justifies and builds the empowered player.

Combined, the articles are independent research contributions that uses player and player characters' encounters with machine vision technologies as a starting point for investigating posthuman configurations within and with virtual environments. The articles investigate how games thematically grapple with shifting agential locus and new subjects of labor and play, focusing on the largely unrecognized non-human agents of games, inspired by critical posthumanist and feminist theories (see chapter 2). Their overall contribution is an understanding of how games depict machine vision technologies and how the relation therein is structured around the tension between superhuman agency and disembodiment on the one hand and distributed agency and embodiment on the other hand.

5. Tensions of human-machine relations in games

Gaining an in-depth understanding of machine vision technologies in games through a posthuman framework (chapter 2) and a mixed methods methodology (chapter 3) leads to the identification of oppositional forces in game representations of human-machine relations, which the articles explore both within the fictional world and in the player-and-game relationship (chapter 4). I refer to these oppositional forces as tensions[28], because they are firmly located in and point beyond existing structures and ideologies of human-machine relations. The notion of tension in the articles is expressed through two strong themes relating to embodiment and agency. Games of machine vision configure both embodiment and agency as problematic. It is in the tensions that we see that machine vision in games is characterized by being always mediated, partial, and embodied, but that this is hidden behind narratives of domination.

Overall, the articles present a tension between the superhuman agency and disembodiment of the Cartesian liberal human on the one hand and the partial embodied posthuman on the other. To see these tensions, I will for clarity's sake discuss the main findings for these tensions in their own sections. Section 5.1 examines the tension between transhuman ideals of disembodiment and posthuman insistence on embodiment. Section 5.2 discusses the tension between the monomythic god-like hero enabled by machine vision technologies and the situated agent in assemblages of distributed agency. In section 5.3, I summarize the characteristics of human-machine relations as developed in my articles, preempting the conclusion in chapter 6. To further examine these tensions, this summary concludes the chapter with applying an assemblage-based approach to situate the article findings into "vaster, churning currents of culture, politics and power" (Jennings 2022).

[28] Tensions are often underlying in game studies research, and have been openly referenced as such in a few cases, for instance Ben Egliston's (2020) research on the tension between watching someone play esports and not being able to perform the same way.

5.1 Embodiment

Machine vision in games expresses tensions related to embodiment. These tensions are explored as degrees of partial embodiment and disembodiment on a diegetic level and in the player-and-game relationship. The close readings in the articles show how embodiment works in machine vision situations. In diegetic machine vision situations, the articles find that artificial intelligences are embodied as holograms (Article II) and player characters are partially embodied through surveillance cameras (Article III). Furthermore, a player's cyborg vision (Article III) shows how machine vision creates tensions when the partial embodied perspectives of player-and-game relationships are hidden behind game design, narrative, and the way the game plays (Article IV).

5.1.1 Disembodied eyes

The close readings in the articles show that the body is often ignored or hidden when a player character interacts with machine vision technologies. Machine vision presents malleable disembodied perspectives, and protagonists that are wholly unchanged by this apparent disembodiment. Oftentimes, players can choose to seamlessly go back and forth between different perspectives, such as zooming out to a bird's eye view or being presented with superimposed perspectives that are beyond the body of the player character. Disembodied maneuvering of the virtual environment is often a rewarded behavior in games[29]. Consider examples like the necessary information overview that aerial drone views provide in the action game *Call of Duty 4: Modern Warfare* (Infinity Ward 2007, further explored in Article IV), the literal separation of mind from body/ies that allows player characters to upload themselves into bodies across the world in the role-playing game *NieR: Automata*

[29] And, flipping the coin, some games present being an embodied subject as a punishment and the body as a problem to be solved. In the simulation game *Do Not Feed the Monkeys* (Fictiorama Studios 2018), the player character CCTV observer can fail their task due to information overload from having to watch too many cameras at the same time, going to get groceries because the stomach is rumbling, or even sleeping. Moreover, the limitations of the body is used as a interface in the adventure game *Before Your Eyes* (GoodbyeWorld Games 2021). The game plays a given scene for as long as the player does not blink. Eventually, the player will blink, which causes a new scene to happen, often mid-sentence, which cuts the narrative of the previous scene. The failures of machine vision here are all on the side of the human; the technology is not presented as faulty.

(PlatinumGames 2017), and the connection to people across the world using subterranean drone networks in the adventure strategy game *Hacker* (Activision 1985). These changed and extended views do not challenge the presentation of the player character's body, and they reward the player with details or abilities necessary to progress in the games.

The disembodied vision that these games present follows transhumanist fantasies of disembodiment. It mirrors N. Katherine Hayles (1999, 5) illustration of how our relations with machines present a tension of embodiment:

> If my nightmare is a culture inhabited by posthumans who regard their bodies as fashion accessories rather than the ground of being, my dream is a version of the posthuman that embraces the possibilities of information technologies without being seduced by fantasies of unlimited power and disembodied immortality, that recognizes and celebrates finitude as a condition of human being, and that understands human life as embedded in a material world of great complexity, on which we depend for our continued survival.

For Hayles, the fear is a version of the cyborg where bodies are disregarded or transcended. She asks, "how could anyone think that consciousness in an entirely different medium would remain unchanged, as if it had no connection with embodiment?" (1999, 1). Instead, as explained in chapter 2, knowledge arises from context;[30] from gender, race, sexuality, dis/ability, class. As Donna Haraway (1988, 582; 583) reminds us, infinite vision and complete objectivity is a god trick. Still, these dreams (Hayles' nightmares; Haraway's god tricks) are presented through a specific masculinist desire for control in games.

5.1.2 Cyborg vision

In opposition to reason and vision that is somehow separate from the knowing body, a posthuman framework allows for reclaiming the body as a site for knowledge generation. To conceptualize games and play from a posthuman perspective is to

[30] Which, as Stephanie C. Jennings (2018, 158) explains, "does not mean that such knowledge would then somehow be invalid because it cannot accomplish a transmission of objective truth. Rather, it means that we need to modify our expectations for objectivity." In this way, objectivity becomes accountability for where it was produced, and it becomes *stronger* (in Haraway's articulation) because it builds on a multitude of perspectives.

understand how the position that the playing is done from influences knowledge and the self.

To reinstate the body in these machine vision situations and games, my concept of cyborg vision (Article III) is a call to recognize the situated and embodied nature of presentations of disembodiment. The concept is a way to explain a human-machine way of seeing the world from embodied partial perspectives. As explained in Article III, cyborg vision is a "partial embodied vision between character perspectives", a "discorrelation of vision from human subjectivity and perspective that I, using Haraway's concepts, place back into embodied forms" (Solberg 2022). In other words and contrary to how it may seem when faced with surveillance cameras and other machine vision mediations, information has not lost its body (Hayles 1999).

9: Cyborg vision in Watch Dogs: Legion

Cyborg vision explains embodied surveillance perspectives in Article III but also proves to be valuable in a larger context of human-machine relations. Cyborg vision allows for seeing a player's visual perspective on the virtual environments of games as a partial perspective, constructed by different agents and creating a specific kind of knowledge. The concept acknowledges the machine vision (be it a diegetic surveillance camera or the game itself) as an agent that contributes to regulating how

we see, what is worth looking at and what we have a right to observe – a recurring theme throughout the articles. Critical posthumanist theorization thus allows for the construction of a self in tension, always accountable for a specific embodied stance but simultaneously partial, never *as god* but *as cyborg*.

Cyborg vision shows that embodiment problematizes bodies of both digital and physical spaces. It is, as N. Katherine Hayles (1999, 122–23; 129) identifies for her analysis of Bernard Wolfe's *Limbo*, a paradox between a structural level where the text works to maintain ideological purities and a constant insistence on a "realization that it cannot unequivocally articulate". Hayles (1999, 130) shows that "the bodies in the text and the body of the text not only represent cyborgs but also together compose a cyborg in which the neologistic splice operates to join imaginative signification with literal physicality". Hayles (1999, 125) calls this the "body of the text" and explains how it is "subject to the same kind of cleavages, truncations, and further cleavages that mark the bodies represented within the text". In other words, the processes that represent bodies also involve bodies (Hayles 1999, 23).

The mirroring between the body of the text and the bodies represented within the text is seen in articles II-IV. For instance, I write in Article II that "the diegetic and the extradiegetic are interpreted together as the holograms mediate 'twice', both for the player character and for the player. In other words, the player character encounters technology (hologram) in parallel with the player encountering technology (game)." (Solberg 2021). Similarly, Article III highlights that cyborg visions allow us to become objects of our own perception: watching my player character self as constructed by diegetic machine visions is mirrored in that the game system is watching and evaluating my player self, and that I can participate in this perception. The relational emphasis here is important to understand the paradox of how embodiment is instantiated but partial.

5.1.3 Becoming data

Another way to conceptualize these various and varying embodiments is on an ontological level of digital existence. Hayles' nightmare of disembodied knowledge

can be abstracted to discussions of artificial intelligences and their influence. This is seen in Article II, where game holograms are presented as bodily manifestations of AIs. In Article II, I ask the question "What does it mean to be present and absent at the same time?" and examine this by comparing the ephemeral-yet-material representation of holograms in games to that of ghosts. The ways ghosts and holograms are represented show that they "become images of hope and fear associated with the limitations of human bodies" (Article II), especially when they are able to impact the physical world while still being not quite here. Such ghostly presence on levels of space, digital materiality, and narrative (Janik 2019a; Ford 2021) challenges what it means to be embodied.

To visualize and sometimes act upon the world around them, AIs embody/are embodied in holographic form. In Article II, I foreground the visual component of embodiment, as "the holograms are about degrees of visibility: being able to physically see the person you are talking with, to rotate an object to understand it in three-dimensional form, to trick someone into thinking they see you, to create an extra set of eyes." Here, machine vision becomes a way to visualize the relation between the player character and the AI[31].

The relation between digital and physical embodiment is often presented as intruding on or fought in the human body. The AI SAM in the adventure game *Observation* (No Code 2019) is embodied as surveillance cameras, drones, and, eventually, the secondary player character. The AI Juno from the action game *Assassin's Creed IV: Black Flag* (Ubisoft Montréal 2013) takes the form of a hologram because she is not strong enough to take corporeal form and possess the player character's body. The player character V from the role-playing game *Cyberpunk 2077* (CD Projekt Red 2020), examined in both Article II and IV, battles for control of their body against the AI construct of a deceased rock star. These struggles clearly show the fears related to

[31] Such visualized embodiment is not without consequences, as seen for instance when AIs are proven to be dominantly portrayed as white (Cave and Dihal 2020).

human-machine relations as being at the cost of the human, which is also a persistent anxiety for questions of agency in games (discussed further in the next section).

Going beyond the diegetic, when players are described to "play beyond ourselves" (Melnic and Melnic 2018, 171) the posthuman player-and-game relation becomes transhuman. As Hayles (1999, 190–91) shows, "it is not a question of leaving the body behind but rather of extending embodied awareness in highly specific, local, and material ways that would be impossible without electronic prosthesis". My research shows, especially Article III with the concept of cyborg vision, that play must always be situated and embodied. In fact, experiences like "immediacy" (Bolter and Grusin 2000) and "flow" (Csikszentmihalyi 1990), often used for games and lauded as inherent properties in the medium, never leave the embodied self. Games can, however, give the illusion that players can escape their bodies[32].

Summarizing, vision plays a prominent role in the imaginary of autonomous and disembodied views. In a posthuman perspective, machine vision visualizes the relation between machines and player characters/players. Through concepts like cyborg vision, machine vision is shown to be always partial, filtered, and embodied.

5.2 Agency

Machine vision in games expresses tensions related to agency. These tensions are revealed by the articles when machine agency becomes explicit, such as cutscenes with varying degrees of player control (Article II) and instances of glitches or faulty machine vision (Article IV). As with tensions of embodiment (seen in the previous section), this tension is often presented as a fear – in this case, the fear of the loss of agency.

5.2.1 Solitary heroes

Machine vision technologies justify asymmetrical power relations between player and game by explaining player character empowerment on a diegetic level. Before

[32] As Brendan Keogh (2018, 14) writes, "all videogames require a body; some just ask that the player's conscious attention be turned away from that body's actions."

looking at the player's empowerment through machine vision here, I wish to exemplify the player character's empowerment. The world-saving heroes that can control everything at the blink of an eye (Fizek 2018a; Jennings 2022) are certainly present in my articles. It is most evident in Article IV, as the article explicitly discusses these issues with examples like Soap in *Call of Duty 4: Modern Warfare*, who retains sight with the use of night vision when his enemies do not. The machine vision empowered hero is also seen in Aloy from *Horizon Zero Dawn* (Guerrilla Games 2017), who has the AR technology Focus that allows her to uncover lost history (Article II), and the Operatives in *Watch Dogs: Legion* (Ubisoft Toronto 2020) that hack into surveillance networks to plan ahead and manipulate their surroundings (Article III). Machine vision technologies justify why player characters have access to information and actions not possible without machine vision.

The conceptualization of the world-savior as built by machine vision depicts the human-machine relation as one of domination. My research finds that such a depiction is a prominent part of the imaginary of machine vision and of games. In Article II, I discuss how the player character Aloy from *Horizon Zero Dawn* is enhanced by machine vision technologies, and how the access to these technologies draw her as unique in the world in which she lives. Stephanie C. Jennings' (2022) analysis of Aloy as the monomythic heroine exemplifies and complements this uniqueness. Combining my (Article II) and Jennings' (2022) analyses, I would argue that machine vision technologies are crucial in building Aloy as the monomythic heroine. Machine vision justifies why Aloy is empowered as the game goes on. Moreover, the heroic military in *Call of Duty 4: Modern Warfare* presents the hegemonic world-savior personified. The "militarized imaginary" tied to a "specific fantasy of agency" (Article IV) seemingly enables protagonistic possibilities beyond their embodied selves. Through "empowered and privileged perspectives" and "enhanced and detached visions" (Article IV), the game serves a white, Western, masculine, imperialist, anthropocentric narrative that builds the player character as a dominant force, firmly situated in the "military-entertainment complex" (Huntemann and Payne 2010).

As mentioned, machine vision is a diegetic justification for the (unfair) advantage of the player. The player character's empowerment explains why players are empowered and given possibilities beyond their embodied selves. In a game design perspective, the use of diegetic machine vision technologies can therefore justify the transhuman disembodied empowerment to keep the player in an (increasingly) empowered role (Article IV). In fact, this monomythic narrative is present in all five textual analyses across my articles. This includes the discussion of the action game *Watch Dogs: Legion* in Article III, which one might be led to believe is outside of such a presentation because player character Operatives are randomly generated and not fixed (in other words, can be switched between). However, the game presents the player in the same privileged position regardless of which Operative they play as. Nothing beyond the outfit that an Operative wear influences available actions in the game, removing embodiment from action. That Operatives can be summoned at will by the player solidifies the image of the player's privileged position[33].

In Article IV, I present how games "build on and feed anthropocentric narratives that places the human player at the center of the game experience, depicting the player as somehow inherently and solely possessing agency". This view places the player as the center for which the world responds and changes. According to Jennings (2022), such views construct an expectation of being able to control and impact, and commends players' experience of dominance over others. The way that games frame machine vision technologies reinforce player individuality. Article III demonstrates with the camera metaphor and representation that this is normalized within games. This normalization illustrates the monomyth's powerful hold on many genres of games (Jennings 2022), where a player's increased empowerment is not only expected but is in danger of being critiqued if it is lacking. This was the case with games such as the adventure game *Gone Home* (Fullbright 2013), which came under attack from #GamerGate (an online and offline movement of misogyny, racism,

[33] This is slightly challenged by "my" Operatives walking past me on their way to whatever it is they want to do when I am not playing them, however, they are still always ready to respond to the player's summons. Thus, the world exists on the player's command, even if the narrative is one of fighting *against* oppression and totalitarianism.

homophobia, and ableism) because it was seen as a "feminist plot to destroy gaming" (Kagen 2017) through its subversion of the horror genre into a queer love story (Van de Mosselaer and Gualeni 2020). In fact, according to Jennings (2022), #GamerGate's operation resembled world-savior games "as each participant became a monomythic hero whose individual choices and actions would save videogames."

The filtered perception of machine vision technologies in games reinforces hegemonic power. This is examined in the articles as corporate efforts to exploit technologies of surveillance (Article III) and weaponization (Article IV). When player characters do not have access or control of machine vision, they are shown to be disempowered. This is the case for V at the beginning of *Cyberpunk 2077* (CD Projekt Red 2020; Article IV) and for Cloud in *Final Fantasy VII Remake* (Square Enix 2020; Article III). For V, regaining hero power is about mastering the machine. For Cloud, the power gained by machine access is in the hands of his enemies. The player that experiences the virtual environment of *Final Fantasy VII Remake* through Cloud has access to multiple perspectives, but this "doesn't change available actions for the player. It results in an experience of knowing and not doing—perhaps a novel feeling for players because in a medium famed for its user influence, disempowerment is rare." (Article III).

5.2.2 Distributed agency

The reason that agency has posed such a conundrum to game studies is that it has often been seen as an isolated quality that is inherent to the player – as *my* power, choice, and influence. Games are lauded as an exceptional medium (Chia and Ruffino 2022)[34], delineating games from other media precisely because of the player's agency. Instead of tying agency to one specific agent, posthuman conceptualizations show how agency exists in the relation. In other words, agency is not only in the hands of the world-saving hero or the player. My intervention into how agency is conceptualized by game studies is a revisiting of the concept of assemblage, often

[34] Chia and Ruffino (2022, 312) state that agency originally "summarized and simplified the complex process of acquisition of the codes and techniques required to manipulate ludic interfaces", which highlights how this exceptionalism came to be. Furthermore, they show how this simplification supports a specific kind of player and how it ties to broader game cultures.

referenced to T.L. Taylor (2009) for game studies but originally attributed to philosophers Gilles Deleuze and Félix Guattari (1987) as “agencement”. The relation between humans and machines in games is, in this sense, very much a question of agency.

In Article II, I am preoccupied with (and grapple with the intangibility of) agency in assemblages:

> Neither actions nor ontological status is isolated from other agents when meeting with holograms in the game. This can be perceived as a new configuration of agency where it is difficult to distinguish between human and non-human agents, whether in terms of identity, visual representation, or game mechanics. In my opinion, holograms show that there has always been such instability in games. We just have to find a way to describe the gray areas that does not sweep a large part of the assemblage under the rug.

Thus, highlighting which agents are present to influence agency is crucial to understand how this is influenced and created. This is the premise of subsequent articles; Article III, which draws attention to the camera’s role in the assemblage, and Article IV’s consideration of visual filters beyond the human spectrum.

Based on the findings from the articles, I operate with the possibility for multiple agencies that combine into different modalities of agency. I find that Jennings’ (2019; 2022) concept of agentic modality is helpful to explore such distribution of agency in an assemblage. Jennings (2022) explains agentic modality as “various assemblage-elements [which] exert unique agencies, but agency is not a property that belongs to any single component”. An agentic modality is the experienced agencies that arise in game assemblages during play, based on elements in the assemblage (Article IV). This understanding of agentic modalities builds on Jennings’ (2019) comprehensive meta-synthesis of agency research in game studies, which concludes with that we should understand agency as plural modalities because the “passive-active binary is not tenable for fully understanding agency in video games”.

In summary, agency plays a prominent role in the imaginary of autonomous god-like heroes. Machine vision builds solitary heroes in and out of games. It is also crucial in

building this image, exerting its own agency. Distributed agencies in assemblages can explain the construction of such images/modalities and how they fluctuate based on context.

5.3 Beyond binaries

In this chapter, I have examined the tensions that arise in relations between humans and machine vision technologies. Tensions are constantly present as a dynamic force in my dissertation. A tension presupposes (or creates) a relation. There is a tension between what I refer to as diegetic machine vision and the machine vision of games as an audiovisual medium. There is a tension in the literature between transhuman ideals and the posthuman. There is a tension between the quantitative and qualitative considerations in the methods I use. There is a tension in machine vision as visualizing human-machine relations and machine vision as immersing the human and hiding the machine from this relation. There is a tension between the military history of machine vision and games and the playful lens we often attribute to both.

The tensions of embodiment in human-machine relations through machine vision are shown in vision and perspectives, in knowledges, and in the reconciliation of physical and virtual. The world-savior through technology is epitomized by the transhuman ideal of going beyond bodies. In combination, the article findings show that transhumanist ideals of disembodiment risk erasing how different bodies have different possible ways of being in the world and that some bodies are devalued against normative bodies. Humanness becomes a political concept that intertwines power in dis/embodiment. Thus, my concept of cyborg vision is an important contribution to reinstate the body in human-machine relations.

The tensions of agency in human-machine relations through machine vision are shown in how machine agency contributes to the imaginary of player autonomy, and how the loss of the perceived all-encompassing human agency intrudes upon a liberal humanist understanding. Refusing player control in games that do not simply follow the monomyth's structure has been described as an indicator of the posthumanity of

games (Ruberg 2022; Fizek 2018b), but my articles extend such insights to an even more tension-filled area than purely computational control on human unplayability, which is when players are lauded for having control (Article IV).

Scholars have intervened in game studies to consider broader frameworks of co-creation, diversity, assemblages, and non-human agents (see section 2.4, or Chia and Ruffino 2022, for an overview). These interventions show how the term agency continues to be relevant to game studies but that it needs examination and reconfiguration. In a special issue aptly called *Politicizing Agency in Digital Play After Humanism*, Aleena Chia and Paolo Ruffino (2022) "examine the ruptures and residues of agency as a liberal humanist ideology that is crystallized *and* critiqued by digital play and game making." Thus, they point to the same tensions that I identify, and show that discussions varying from control to emotion to watching others play structured around the term agency must be able to hold these conflicts or tensions in mind. My focus on the depictions of machine vision and the themes of embodiment and agency therein show how games are always partial and embodied but can provide the opposite experience. Thus, my contribution to this ongoing debate in game studies is embracing the cyborg as assemblage to uncover hidden agents, both in the fictional world and mirrored in the player-and-game relationship.

In dealing with presentations of human-machine relations as tensions, I am aware that the focus is in danger of reinstating the traditional game studies dichotomy of freedom versus constraint (of body, of action). The tensions I discuss are not to be thought of as separate from each other but as intermingled, informing each other every step of the way. As this chapter has shown, I try to reconcile the cyborg from within the cyborg. Considering the cyborg as a liberative source of power from within a medium that itself is a cyborgian construction that enforces optimization and meritocratic design is perhaps why my answer lies in the tension. Through this attempt, my contribution is returning the machine to the assemblage (or highlighting that it never left) while also bringing the player's body to this context.

The findings in my articles support that instead of "either/or", cyborgs and assemblages help us consider these relations as a double-orientated "yes, and". Staying with the trouble (Haraway 2016) and exploring the tensions means that we can consider the strong connection between games and machine vision technologies while also acknowledging other parts of the assemblage. For the human-machine relations, this means that the human is not a human in opposition to animals, environment, or machines (Humanism) nor is it a human that ceases to be in itself (transhumanism). It is a human that is always in relation (posthumanism), constituted by the partial, in the assemblages, that moves towards an understanding of players as becoming part of a hybrid of humans and machines wherein agency moves with the relations between agents (Keogh 2018, 26; Janik 2019b).

6. Conclusion: Being-in-the-assemblage

Machine vision in games is characterized by a double-orientedness that caters to the fictional world and to the player-and-game relationship. Games present human-machine relations of machine vision as tensions between the partial and embodied agents and totalitarian and disembodied agents. Machine vision is always mediated, partial, and embodied, but hidden behind and complicit in narratives of domination.

The articles present several characteristics of machine vision in games. First, machine vision are agents; sometimes characterized in the fiction with motives of their own (as a seeing entity, often in collaboration with other technologies using artificial intelligence or neural networks) but mostly as various tools that can be utilized by a player character or an antagonist to become superhuman (articles I-IV). Second, machine vision is omniscient and powerful, providing otherwise unattainable perspectives and opportunities of influence (articles III and IV). Here, diegetic machine vision justifies transhuman disembodied empowerment to keep the player in an (increasingly) empowered role (Article IV). Third, machine vision is human (or for the human). This is seen for instance with x-ray or infrared wavelengths that are translated into a human's visible spectrum. Machine vision is always this process or rendering from machinic agencies and processes to a distinctly human visualization or interpretation of this. What machine vision does is make these tensions explicit (Article IV). Moreover, evident in the dataset I have built is that machine vision is a mandatory part of the main narrative of the games in my corpus. This means that a player character (and player) must experience the machine vision to progress in the game, a finding which emphasizes the world-building importance of machine vision.

The stories and capabilities when faced with machine vision in games feed into a certain kind of narrative of superhuman mastery that perpetuates both games' and machine vision's history. But posthuman theory shows that this image does not accurately describe human-machine relations. Phrased differently, if machine vision in games tells us that human-machine relations are about control and mastery, how can we understand the actual relationship hidden behind this representation? Through

a posthuman lens, which disavows ideas of universal views and all-encompassing knowledge, there is the possibility for alternative perspectives. Through a posthuman lens, the articles show that machine vision in games is characterized by being mediated, partial, and embodied. Machine vision is a way of seeing the world that impacts how we see the world – a structured filter that controls vision. It consists of multiple agents that collaborate through oscillating power relations in assemblages. The posthuman understanding of machine vision in games therefore highlights relations between human and machine agents without dissolving the bodies that combine to build those relations.

Machine vision as a structured filter that controls vision is reflected beyond the diegetic. The game itself reminds us that the visions that games present are always mediated, embodied, partial, and filtered. Conversely, a screenshot of drone vision from a first-person view and a screenshot of eagle vision from a first-person view would be similar to one another. The difference between eagle vision and drone vision is in the narrative framing, but this will often have consequences for which actions and aesthetics a player is met with. Different machine-like visions are rendered familiar in games[35]. Games do not just represent machine vision; they are machine vision.

6.1 Implications

The articles and this synopsis reveal tensions in how the filtered perception of machine vision in games is linked with hegemonic power, and use posthumanism to develop a way of thinking and playing as simultaneously embodied and partial in an assemblage. Through these analyses, I present characteristics of machine vision in games and the potential therein to (re)conceptualize relations between humans and machines. As such, the dissertation demonstrates that the experience of playing a

[35] Consider examples such as the affective vision in *Desperados: Wanted Dead or Alive* (Spellbound Entertainment 2001) or the body-as-machine vision in *Disco Elysium* (ZA/UM 2019).

game is a fundamentally distributed and situated phenomenon between human and machine agents, but that is not always how it presents itself.

In a conference paper (Solberg 2021b), I analyzed the role-playing game *NieR: Automata* (PlatinumGames 2017) and found that it gives "the realization of being-in-the-assemblage" and invites us to delete "a certain kind of player – the player that game cultures have presented for decades, the player that is the master, in control, with worlds at their fingertips". Without realizing at the time that this would be a major point in my dissertation, I pointed to *tensions* "between accelerating and inhibiting agency, in gathering and distributing perspectives, in prompting continuation and condemning it" which "prompts us to imagine the somewhat paradoxical posthuman future of the human present". The conference paper title was phrased as a question: "Playing posthumanism?" Here, in the conclusion to this dissertation, I remove the question mark.

Playing posthumanism is a form of subversive, meta, or transgressive play (Aarseth 2007; Leino 2010; Boluk and Lemieux 2017; Jørgensen and Karlsen 2018; Lammes and de Smale 2018); an act of rebellion against the "tyranny of the game" (Aarseth 2007) and against "dominating ways of inscribing and imagining 'the player'" (Sundén 2009). It is first and foremost a transformative play. It does not place in the player's hands the power to transform what is already there, but it can transform our conceptions of what we experience. To look at the cyborg, embedded in its militarized tradition, and destabilize its meaning is to follow in Donna Haraway's footsteps as a refusal to adapt to pre-existing normativity. It shows how we can confuse boundaries and be responsible in their construction (Haraway 1991, 150) at the same time. Thus, playing posthumanism is the understanding – as Justyna Janik (2018) points out – that we are "not just playing around IN a game, we are playing around WITH the game". Playing posthumanism is the relational understanding of being-in-the-assemblage.

Similar to how Donna Haraway's cyborg takes a traditional epistemology and reimagines it, I use the partiality of posthuman relations to reimagine the player.

Playing posthumanism is a feminist-epistemological approach (Jennings 2018) to the human-machine relation of playing games. Using diegetic machine vision and posthuman theories as a starting point opens for investigating machine agents. My study is therefore aligned with the increased scholarly attention to automation of play and games, but without isolating non-human agents. The cyborg both methodologically and theoretically allows for looking at the relations that emerge, as a way of understanding the cyborg from within the cyborg.

In doing this, this dissertation contributes to scholarly work examining games from posthuman and feminist perspectives. On a fundamental level, the dissertation derives from the assumption that players are the focal point. Through revisiting the game assemblage (Taylor 2009), my research differentiates itself from current research in showing how these assemblages are dynamic constellations that can hold both posthuman and transhuman experiences in the fiction of the game and in the player-and-game relationship. The dissertation provides an in-depth view of existing research on dismantling hegemonies of games and game cultures, but also empirical data which shows how games, as both enacting and depicting, can simultaneously reify and challenge dominant ideologies. Additionally, the dissertation outlines a methodological approach of combining qualitative and quantitative methods to the studies of games. A large part of the scientific contribution of this dissertation is in the creation of the dataset and the Machine Vision database structure.

The articles and the previous chapters have pointed towards implications of this research. A theoretical implication shown in articles II-IV and the review of critical posthumanist literature in chapter 2 is that the posthuman in games easily falls into transhumanist ideals and erases part of the importance of the hybridization. The cyborg as partial embodiment can be seen as a convenient utopian conceptualization. But hybridization is not a resolution; Haraway (2003) shows that one cannot walk away from the uncomfortable sensation of contradiction. Staying in the hybridization contributes to game studies an understanding of how games are simultaneously hegemonic technomasculinist systems and distributed embodied systems. Using machine vision as a starting point for examining relations in assemblages, this

dissertation shows how to avoid the intentional or unintentional misapplication of posthumanism through focusing on machine agents. The focus on machine vision in games specifically has allowed me to reveal the close connection between posthumanism and transhumanism without conflating the two. This insight will be useful for scholars in philosophy of technology and game studies, as well as the broader fields of media studies, gender studies, and digital humanities.

For developers and the broader game industry, this dissertation shows a trajectory of science fiction-related game design and signals possible ways to go beyond existing tropes. Because of the strong connection between games, machine vision technologies, and the hegemonic masculinist military-industrial complex, development must actively decide to design for inclusivity to avoid perpetuating hegemony. This must be done in all aspects of the assemblage, from the distinctly male-dominated AAA game industry workplaces and the design of games (Vysotsky and Allaway 2018) to players and cultural reception. Instead of structuring games around dehumanizing or marginalizing logics (Phillips 2020) and fueling narratives that cater to a seemingly universal audience, non-normative and relational conceptualizations of games and play is feasible, proving valuable for sensitivities that are not (yet) systematically ingrained in the AAA industry (LaPensée 2017; Mukherjee 2017; Murray 2018; de Wildt et al. 2019; Aguilera 2022; Trammell 2022). Rethinking games from a hegemonic masculinist thinking can also stop the effect of treating the more casual games market as feminized and lead to an industry that caters to a broader intended audience[36].

The experience of becoming aware that we are entangled with machine agents, bodies, and agencies can be uncomfortable. When the image of human autonomy is challenged, players may feel that they are objectified and perhaps rendered non-human themselves (Johnson 2015). Faced with outcomes and events beyond "our"

[36] See e.g. Shira Chess (2018) for the brilliant "I did not fail at GTA3. GTA3 failed at me."

control, players might attempt to regain their hero status through unconvential play[37] (Ruffino 2022). The posthuman agencies outlined in this dissertation might indeed "articulate our contemporary feelings of fragility" (Chia and Ruffino 2022). But, as N. Katherine Hayles (1999) reminds us, the ability to conceptualize oneself as autonomous is intrinsically connected to power and position and only allowed to a select few. Such posthuman experiences of the non-human destabilize anthropocentric assumptions (Caracciolo 2021) and offer a space that is disorienting to normative bodies where "we fit in and you have to feel what it's like to be constantly refused by the world you are navigating" (Vist 2015). Acknowledging agencies beyond (a specific) human centrism can thus open for new conceptualizations of players and games. It is in the tensions and relations that these new conceptualizations are found.

In summary, the combination of articles I-IV presents a multi-faceted perspective of how relationships between human and machine agents are negotiated in games, which contributes to our understanding of how we can use games to understand and problematize human-machine relations. Machine vision is continuing to shape how we perceive and imagine the world, and games present hopes and fears related to how these technologies shape individuality and power. The dissertation is a close study of vision and perception in games, and how vision works within the embodied context of play. Four articles shed light on how games thematically grapple with shifting agential locus and new subjects of labor and play, focusing on the largely unrecognized machine agents of games. Together, the articles demonstrate how the perspectives of mediated vision are partial and embodied, which necessitates considering machine vision technologies as agents. These posthuman entanglements embrace the inherent messy and porous bodies of playing games, which allows for investigating both elements as constitutive of each other.

[37] The question of if it is possible "to make different choices, play against the grain, develop queer algorithms in a medium that in the deepest sense maintains a strict binary: zero or one, no or yes?" (Chang 2017) is, incidentally, also a question that resurfaced when the machine vision project team created the database.

6.2 Future vision

Growing up, I was utterly fascinated with the role-playing game *Suikoden II* (Konami 1998/2000). Its magical soundtrack, pleasant pixel art, puzzles and battle mechanics, explorations and adventures, numerous complex non-player characters, and compelling monomyth adventure aside, I became transfixed with a peculiar design feature. The protagonist and player character Riou can travel between areas on the "world map", quite literally walking on the map. If, however, Riou receives no input from the player over a long period of time, he will not just stand there. He will flex his nunchucks, practice fighting and move (within a certain area). After a short while, he will stop and wait for the player's input again. If a player never idles in the world map, they will never find this feature.

Let me be clear; there is no diegetic thematized machine vision in *Suikoden II*. However, it became one of my first encounters to challenge the idea that the game is a machine that exists only at my will – a common marketing strategy in the nineties (and still is at the time of writing this). Riou did something that I did not tell him to. In this particular moment, he did not help me nor hinder me in my hero quest; it was not in "the service of player, protagonist or plot" (Jayanth 2016). He is programmed to do this "ambience act" (Galloway 2006) when I do not do anything. The game seizes the opportunity to showcase its computational agency and reframes the play situation as interpassive (Fizek 2018c). For a young me, it solidified that machine agents have always been there: in NPCs, bots, macros, cutscenes, in the computational processes and hardware of the game system.

Since, I have come to realize that this goes for all games. The simulation game *NITE Team 4* that introduced this synopsis also shows machine agency. The clear emphasis on coding and hacking literally forefronts the machine's processes and visualizations of various machine vision technologies. Without the translation act of the many machine vision technologies – the in-game drones and thermal filters, the superimposed screen, the game itself – this experience would not be. But the game is thematically about having increased amounts of global power for the seemingly

disembodied player character hacker that has the world at their fingertips. My dissertation show that this myth is perpetuated in games. Such myths of uniform and god-like heroes "can lead us to unwittingly reinforce unhelpful cultural and social norms" (Jayanth 2016). Games are often designed for our pleasure, to control, to be important, to influence, but this is a problem because "who ever heard of that great novel where the protagonist got exactly what they wanted all the time?" (ibid). Instead, I propose a posthuman reorientation of the conceptualization of machine vision technologies, including games.

As shown in my articles and in this synopsis, there are attempts already in place in games and game studies to reimagine the relation between humans and machines. Going forward, I hope my research provides the basis for more scholarly inquiries into the tensions of posthuman relations in games, especially as they construct and/or destabilize a certain kind of player. I also hope that game developers will use emerging posthuman game studies debates and concepts to reimagine game design. Albeit focused on games specifically, the broader tensions addressed in this dissertation provide a starting point for more fruitful discussions in other scholarly fields. For instance, seeing artificial intelligences and machine learning as undermining anthropocentrism while also acknowledging the human's role and responsibility in creating such systems will be crucial as new technologies develop and existing technologies are used in new ways. Keeping in mind that knowledge is always embodied and partial, always instantiated in a medium, will help counter transhuman fantasies and keep humans accountable in complex political and ethical debates to come.

For this research specifically, I have gathered more data material than what I could fit in this dissertation. Luckily, much of the data is openly accessible to use in future research (Rettberg, Kronman, Solberg, Gunderson, Bjørklund, Stokkedal, de Seta, Jacob, and Markham, 2022). I see future research using this data to investigate diachronic changes in actions taken by agents in machine vision situations, or, following calls for intersectional approaches to game studies (Kafai, Richard, and Tynes 2017; Gray and Leonard 2018; Shaw 2018), player character representations

(Hitchens 2011). Other interesting points of departure would be supplementing the data with more attention to the process of creating machine vision representations in games – with particular focus on regionality, gender, and time and economic issues for developers and publishers. Attention to platforms and genres might also uncover other and new ways of representing machine vision, and player studies could illuminate if this partial and situated knowledge is received in a similar manner for other players.

Regardless of the focus, it is important that scholars using what I view as near-holistic frameworks mind what is left out; what is unseen. For assemblages, the scalability is a hindrance, and methodological questions as to where the assemblage is conceptualized. I firmly believe that the most important caveat to the assemblage is the *lack of* constructions of relations and its ethical implications. In other words, who or what can be in an assemblage in the first place? Which agents, structures, or traits are excluded from a "normative" assemblage? Power differentials impact who can form these agential relations. In my research, I have mostly directed this attention to machine agents at play. This choice has led to not seeing other parts of the assemblages – parts that will be salient for myself or other scholars to investigate in the future. From considerations of pre-programmed decision-making of computational systems (Ruberg 2022), to the (exploitation) in collection of minerals for the game hardware to game creation to playing to promotional materials, reviews, and research (Dyer-Witheford and De Peuter 2009; Jennings 2022), to the broader implications for global climate in the game industry (Abraham 2022), there is much yet in the assemblage to discover and scrutinize.

What machine vision in games is not to be taken as, is a recipe or standardized ideal for future design. This would reify existing characteristics of normative designs that disproportionately disempowers those at the margins. Through the application of posthumanism, we are made aware of flaws in human-machine relations, but this does not mean that a mere shift in thinking solves all the problems related to anthropocentrism and hegemonic ideals in games and machine vision alike. Throughout my research, the broader themes of machine vision as seen through

posthumanism in games exemplify this realization. Machine vision decentralizes the human, the player, the traditionally conceptualized heroes-as-gods, even as it battles itself in trying to decentralize these. Humanness is a constructed concept, one which perhaps is not completely humanist or posthumanist. Rather, it is continually negotiated in the tension of its representations. The tension captures the transgressive figure as well as its complicitly in militaristic, hegemonic, and patriarchal systems. In games, we play out this tension.

My lifelong investment in and appreciation for games is why I wrote this dissertation, and why I play the way I do. I see games as possibilities, or, in the brilliant words of Meghna Jayanth (2021), “the possibilities as yet unexplored, which are hidden by what currently is”. The point is that what is not there – what Riou and I cannot do – is part of the tension and influences us too. But rethinking and imagining what could be can have real consequences. As part of that endeavor, I hope the articles of this dissertation show the complex histories and assemblages of machine vision and games, and that “Playing posthumanism” inspires more inclusive and democratic forms of creating and playing games.

Works cited

2K Boston. 2007. *Bioshock*. Microsoft Windows. 2K Games.

Aarseth, Espen. 2003. “Playing Research: Methodological Approaches to Game Analysis.” In *Proceedings of the Digital Arts & Culture Conference*. Melbourne. https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1048.415&rep=rep1&type=pdf.

———. 2007. “I Fought the Law: Transgressive Play and the Implied Player.” In *Situated Play, Proceedings of DiGRA 2007 Conference*. Tokyo, Japan. http://www.digra.org/wp-content/uploads/digital-library/07313.03489.pdf.

Abraham, Benjamin J. 2022. *Digital Games After Climate Change*. Cham, Switzerland: Palgrave Macmillan.

Activision. 1985. *Hacker*. Microsoft Windows.

———. 1996. *Spycraft*. Microsoft Windows.

Aguilera, Earl R. 2022. “Theorizing Whiteness as a Proceduralized Ideology in Videogames.” *Journal of Games Criticism* 5 (A). http://gamescriticism.org/articles/aguilera-5-a.

Alice & Smith. 2018. *NITE Team 4*. Microsoft Windows.

Arsenault, Dominic, and Bernard Perron. 2009. “In the Frame of the Magic Cycle: The Circle(s) of Gameplay.” In *The Video Game Theory Reader 2*, edited by Bernard Perron and Mark J.P. Wolf, 109–31. New York, NY, USA: Routledge.

Ask, Kristine. 2016. “Ludic Work: Assemblages, Domestications and Co-Productions of Play.” Doctoral dissertation, Trondheim: Norwegian University of Science and Technology (NTNU). https://ntnuopen.ntnu.no/ntnu-https://ntnuopen.ntnu.no/ntnu-xmlui/bitstream/handle/11250/2418295/Kristine%20Ask_PhD.pdf.

Bartle, Richard. 1996. “Hearts, Clubs, Diamons, Spades: Players Who Suit MUDs.” *Journal of MUD Research* 1 (1). https://mud.co.uk/richard/hcds.htm.

Bell, Kristina, Nicholas Taylor, and Christopher Kampe. 2015. “Of Headshots and Hugs: Challenging Hypermasculinity through The Walking Dead Play.” *ADA: A Journal of Gender, New Media & Technology* 4 (7). https://adanewmedia.org/2015/04/issue7-bellkampetaylor/.

Benjamin, Ruha. 2019. *Race After Technology: Abolitionist Tools for the New Jim Code*. Cambridge, UK: Polity.

Berg, Anne-Jorunn, Agnes Bolsø, and Ingvil Hellstrand. 2020. "Posthumanistiske muligheter og transhumanistiske blindspor i det antropocene [Posthumanist Possibilities and Transhumanist Dead Ends in the Anthropocene]." *Tidsskrift for kjønnsforskning* 44 (4): 285–98. https://doi.org/10.18261/issn.1891-1781-2020-04-04.

Björk, Staffan, and Jesper Juul. 2012. "Zero-Player Games. Or: What We Talk about When We Talk about Players." Conference paper presented at the The Philosophy of Computer Games Conference, Madrid, Spain. http://www.jesperjuul.net/text/zeroplayergames.

Bogost, Ian. 2008. "The Rhetoric of Video Games." In *The Ecology of Games: Connecting Youth, Games, and Learning*, by Katie Salen, 117–40. Cambridge, MA: MIT Press. https://doi.org/10.1162/dmal.9780262693646.117.

Bolter, Jay David, and Richard Grusin. 2000. *Remediation: Understanding New Media*. Cambridge, MA: MIT Press.

Boluk, Stephanie, and Patrick Lemieux. 2017. *Metagaming: Playing, Competing, Spectating, Cheating, Trading, Making, and Breaking Videogames*. Minneapolis, MN: University of Minnesota Press.

Boulter, Jonathan. 2015. *Parables of the Posthuman: Digital Realities, Gaming, and the Player Experience*. Detroit, MI: Wayne State University Press.

Bousquet, Antoine. 2018. *The Eye of War: Military Perception from the Telescope to the Drone*. Minneapolis, London: University of Minnesota Press.

Braidotti, Rosi. 2013. *The Posthuman*. Cambridge: Polity Press.

———. 2022. *Posthuman Feminism*. Cambridge, UK; Medford, MA: Polity Press.

Braidotti, Rosi, and Maria Hlavajova, eds. 2018. *Posthuman Glossary*. London; New York, NY: Bloomsbury Academic.

Browne, Simone. 2015. *Dark Matters: On the Surveillance of Blackness*. Durham, NC: Duke University Press.

Buolamwini, Joy. 2016. *The Coded Gaze: Unmasking Algorithmic Bias*. Video Poem. https://youtu.be/162VzSzzoPs.

Caracciolo, Marco. 2021. “Animal Mayhem Games and Nonhuman-Oriented Thinking.” *Game Studies* 21 (1). http://gamestudies.org/2101/articles/caracciolo.

Carr, Diane. 2009. “Textual Analysis, Digital Games, Zombies.” In *DiGRA ’09 - Proceedings of the 2009 DiGRA International Conference*. Vol. 5. Brunel University, UK. http://www.digra.org/wp-content/uploads/digital-library/09287.241711.pdf.

———. 2019. “Methodology, Representation, and Games.” *Games and Culture* 14 (7–8): 707–23. https://doi.org/10.1177/1555412017728641.

Cave, Stephen, and Kanta Dihal. 2020. “The Whiteness of AI.” *Philosophy & Technology* 33 (4): 685–703. https://doi.org/10.1007/s13347-020-00415-6.

Cawthon, Scott. 2014. *Five Nights at Freddy’s*. Microsoft Windows.

CD Projekt Red. 2020. *Cyberpunk 2077*. Microsoft Windows. CD Projekt.

Chang, Edmond Y. 2017. “A Game Chooses, a Player Obeys: BioShock, Posthumanism, and the Limits of Queerness.” In *Gaming Representation: Race, Gender, and Sexuality in Video Games*, edited by J. Malkowski and T.M. Russworm, 227–42. Bloomington, IN: Indiana University Press.

Chauvette, Amelia, Kara Schick-Makaroff, and Anita E. Molzahn. 2019. “Open Data in Qualitative Research.” *International Journal of Qualitative Methods* 18: 160940691882386. https://doi.org/10.1177/1609406918823863.

Cheney-Lippold, John. 2017. *We Are Data: Algorithms and the Making of Our Digital Selves*. New York, NY: New York University Press.

Chess, Shira. 2018. “Hardcore Failure in a Casual World.” *The Velvet Light Trap*, The Futures of Game Studies, 81 (1): 60–62.

Chia, Aleena, and Paolo Ruffino. 2022. “Special Issue Introduction: Politicizing Agency in Digital Play after Humanism.” *Convergence* 28 (2): 309–19. https://doi.org/10.1177/13548565221100135.

Chunsoft, Spike. 2019. *AI: The Somnium Files*. Microsoft Windows. Numskull Games.

Cole, Alayna, and Dakoda Barker. 2021. *Games as Texts: A Practical Application of Textual Analysis to Games*. Boca Raton, US: CRC Press.

Consalvo, Mia. 2013. “Videogame Content: Game, Text, or Something Else?” In *The International Encyclopedia of Media Studies: Media Effects: Volume III*, edited by Angharad N. Valdivia and Erica Scharrer. Blackwell Publishing Ltd.

Cover, Rob. 2018. “The Corporeal Ethics of Gaming: Vulnerability, Mobility, and Social Gaming.” In *Woke Gaming: Digital Challenges to Oppression and Social Injustice*, edited by Kishonna L. Gray and David J. Leonard, 27–44. Seattle, WA: University of Washington Press.

Csikszentmihalyi, Mihaly. 1990. *Flow: The Psychology of Optimal Experience*. New York, NY, USA: Harper & Row.

Daneels, Rowan, Maarten Denoo, Alexander Vandewalle, Bruno Dupont, and Steven Malliet. 2022. “The Digital Game Analysis Protocol (DiGAP): Introducing a Guide for Reflexive and Transparent Game Analyses.” *Game Studies* 22 (2). http://gamestudies.org/2202/articles/gap_daneels_denoo_vandewalle_dupont_malliet.

Deleuze, Gilles, and Felix Guattari. 1987. *A Thousand Plateus: Capitalism and Schizophrenia [Mille Plateaux, Capitalisme et Schizophrenic]*. Translated by Brian Massumi. Minneapolis, MN: University of Minnesota Press. https://libcom.org/files/A%20Thousand%20Plateaus.pdf.

Deshbandhu, Aditya. 2020. *Gaming Culture (s) in India: Digital Play in Everyday Life*. London, UK: Routledge, Taylor & Francis Group.

Digital Pictures. 1992. *Night Trap*. Microsoft Windows. Sega.

Don’t Look Team. 2019. *Don’t Look*. Microsoft Windows/Tobii Eye Tracker 4.

DuBois, James M., Michelle Strait, and Heidi Walsh. 2017. “Is It Time to Share Qualitative Research Data?” *Qualitative Psychology* 5 (3): 380. https://doi.org/10.1037/qup0000076.

Dyer-Witheford, Nick, and Greig De Peuter. 2009. *Games of Empire: Global Capitalism and Video Games*. Electronic Mediations 29. Minneapolis, MN: University of Minnesota Press.

EA DICE. 2008. *Mirror’s Edge*. Microsoft Windows. Electronic Arts.

Egliston, Ben. 2020. “‘Seeing Isn’t Doing’: Examining Tensions between Bodies, Videogames and Technologies ‘beyond’ the Game.” *New Media & Society* 22 (6): 984–1003. https://doi.org/10.1177/1461444819875078.

Eubanks, Virginia. 2018. *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor*. New York, NY: St. Martin's Press.

Farocki, Harun. 2004. "Phantom Images." *Public*, no. 29. https://public.journals.yorku.ca/index.php/public/article/view/30354.

Fictiorama Studios. 2018. *Do Not Feed the Monkeys*. Microsoft Windows. Alawar Premium.

Firaxis Games. 2016. *Sid Meier's Civilization VI*. 2K Games.

Fizek, Sonia. 2018a. "Automated State of Play: Rethinking Anthropocentric Rules of the Game." *Digital Culture & Society* 4 (1): 201–14. https://doi.org/10.14361/dcs-2018-0112.

———. 2018b. "Automation of Play: Theorizing Self-Playing Games and Post-Human Ludic Agents." *Journal of Gaming & Virtual Worlds* 10 (3): 203-218(16). https://doi.org/10.1386/jgvw.10.3.203_1.

———. 2018c. "Interpassivity and the Joy of Delegated Play in Idle Games." *Transactions of the Digital Games Research Association* 3 (3). https://doi.org/10.26503/todigra.v3i3.81.

———. 2022. "Through the Ludic Glass: Making Sense of Video Games as Algorithmic Spectacles." *Game Studies* 22 (2). http://gamestudies.org/2202/articles/gap_fizek#_edn1.

Flanagan, Mary. 2016. "Critical Play." In *A Companion to Digital Art*, edited by Christiane Paul, 445–59. Chichester, West Sussex: John Wiley & Sons. https://doi.org/10.1002/9781118475249.ch20.

Ford, Dom. 2021. "The Haunting of Ancient Societies in the Mass Effect Trilogy and The Legend of Zelda: Breath of the Wild." *Game Studies* 21 (4). http://gamestudies.org/2104/articles/dom_ford.

Fox, Alice. 2021. "The (Possible) Future of Cyborg Healthcare: Depictions of Disability in Cyberpunk 2077." *Science as Culture* 30 (4): 591–97. https://doi.org/10.1080/09505431.2021.1956888.

Fron, Janine, Tracy Fullerton, Jacquelyn Ford Morie, and Celia Pearce. 2007. "The Hegemony of Play." In *Situated Play, Proceedings of DiGRA 2007 Conference*. Tokyo, Japan. http://www.digra.org/wp-content/uploads/digital-library/07312.31224.pdf.

Fullbright. 2013. *Gone Home*. Microsoft Windows.

———. 2017. *Tacoma*. Microsoft Windows.

Gallagher, Rob. 2022. "Humanising Gaming? The Politics of Posthuman Agency in Autobiographical Videogames." *Convergence* 28 (2): 359–73. https://doi.org/10.1177/13548565221083485.

Galloway, Alexander R. 2006. *Gaming: Essays on Algorithmic Culture*. Vol. 18. Electronic Mediations. Minneapolis, MN: University of Minnesota Press.

Gane, Nicholas, and Donna Haraway. 2006. "When We Have Never Been Human, What Is to Be Done?: Interview with Donna Haraway." *Theory, Culture & Society* 23 (7–8): 135–58. https://doi.org/10.1177/0263276406069228.

Gee, James Paul. 2003. *What Video Games Have to Teach Us about Learning and Literacy*. New York: Palgrave Macmillan.

Giddings, Seth. 2005. "Playing With Non-Humans: Digital Games as Techno-Cultural Form." In *DiGRA '05 - Proceedings of the 2005 DiGRA International Conference: Changing Views: Worlds in Play*. http://www.digra.org/wp-content/uploads/digital-library/06278.24323.pdf.

Golding, Daniel. 2013. "To Configure or to Navigate? On Textual Frames." In *Terms of Play : Essays on Words That Matter in Videogame THeory*, edited by Zach Waggoner, 28–46. Jefferson, NC: McFarland & Company, Inc., Publishers.

GoodbyeWorld Games. 2021. *Before Your Eyes*. Microsoft Windows/Tobii Eye Tracker. Skybound Games.

Gray, Kishonna L., and David J. Leonard. 2018. "Not a Post-Racist and Post-Misogyny Promised Land: Video Games as Instruments of (In)Justice." In *Woke Gaming: Digital Challenges to Oppression and Social Injustice*, edited by Kishonna L. Gray and David J. Leonard, 3–23. Seattle, WA: University of Washington Press.

Guerrilla Games. 2017. *Horizon Zero Dawn*. PlayStation 4. Sony Interactive Entertainment.

Hammar, Emil Lundedal. 2017. "Counter-Hegemonic Commemorative Play: Marginalized Pasts and the Politics of Memory in the Digital Game Assassin's Creed: Freedom Cry." *Rethinking History* 21 (3): 372–95. https://doi.org/10.1080/13642529.2016.1256622.

Haraway, Donna. 1988. “Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective.” *Feminist Studies* 14 (3): 575–99.

———. 1991. *Simians, Cyborgs, and Women: The Reinvention of Nature*. London: Free Association Books.

———. 2003. Prospects for a Materialist Informatics: An Interview with Donna Haraway Interview by Lisa Nakamura. Electronic Book Review. http://electronicbookreview.com/essay/prospects-for-a-materialist-informatics-an-interview-with-donna-haraway/.

———. 2016. *Staying with the Trouble: Making Kin in the Chtulucene*. Durham and London: Duke University Press.

Harrell, D Fox, and Jichen Zhu. 2009. “Agency Play: Dimensions of Agency for Interactive Narrative Design.” In *AAAI Spring Symposium: Intelligent Narrative Technologies II*, 44–52. http://www.aaai.org/Papers/Symposia/Spring/2009/SS-09-06/SS09-06-008.pdf.

Hayles, N. Katherine. 1999. *How We Became Posthuman*. Chicago, IL: The University of Chicago Press.

———. 2016. “Cognitive Assemblages: Technical Agency and Human Interactions.” *Critical Inquiry* 43 (1): 32–55. https://doi.org/10.1086/688293.

———. 2017. *Unthought: The Power of the Cognitive Nonconscious*. Chicago, IL: University of Chicago Press.

Heritage, Frazer. 2021. “Gender in a General Corpus of Videogames.” In *Language, Gender, and Videogames*, 111–45. Cham, Switzerland: Springer Nature Switzerland AG. https://doi.org/10.1007/978-3-030-74398-7_5.

Hitchens, Michael. 2011. “A Survey of First-Person Shooters and Their Avatars.” *Game Studies* 11 (3). http://gamestudies.org/1103/articles/michael_hitchens.

Huntemann, Nina B., and Matthew Thomas Payne, eds. 2010. *Joystick Soldiers: The Politics of Play in Military Video Games*. New York, NY: Routledge, Taylor & Francis Group.

Ihde, Don. 1990. *Technology and the Lifeworld*. Bloomington: Indiana University Press.

Infinity Ward. 2007. *Call of Duty 4: Modern Warfare*. Microsoft Windows. Activision.

InnerSloth LLC. 2018. *Among Us*. Microsoft Windows. InnerSloth LLC.

Janik, Justyna. 2017. “Glitched Perception: Beyond the Transparency and Visibility of the Video Game Object.” *TransMissions: The Journal of Film and Media Studies* 2 (2): 65–82.

———. 2018. “Game/r - Play/Er - Bio-Object. Exploring Posthuman Values in Video Game Research.” In *Proceedings of The 2018 Philosophy of Computer Games Conference*. Copenhagen, Denmark. https://gameconference.itu.dk/papers/14%20-%20janik%20-%20gamer%20player%20bioobject.pdf.

———. 2019a. “Ghosts of the Present Past: Spectrality in the Video Game Object.” *Journal of the Philosophy of Games* 1. https://doi.org/10.5617/jpg.2943.

———. 2019b. “Meaningful Transformation: Intra- Activity and Video Games.” In *DiGRA ’19 – Abstract Proceedings of the 2019 DiGRA International Conference: Game, Play and the Emerging Ludo-Mix*, 3. http://www.digra.org/digital-library/publications/meaningful-transformation-intra-activity-and-video-games/.

Jayanth, Meghna. 2016. “Forget Protagonists: Writing NPCs with Agency for 80 Days and Beyond.” Conference paper presented at the Game Narrative Summit at GDC 2016, San Francisco, CA, March 14. https://medium.com/@betterthemask/forget-protagonists-writing-npcs-with-agency-for-80-days-and-beyond-703201a2309.

———. 2021. “White Protagonism and Imperial Pleasures in Game Design #DIGRA21.” Keynote, DiGRA India Conference 2021: Game Culture(s) and India, November 20. https://medium.com/@betterthemask/white-protagonism-and-imperial-pleasures-in-game-design-digra21-a4bdb3f5583c.

Jennings, Stephanie C. 2018. “The Horrors of Transcendent Knowledge: A Feminist-Epistemological Approach to Video Games.” In *Woke Gaming: Digital Challenges to Oppression and Social Injustice*, edited by Kishonna L. Gray and David J. Leonard, 155–71. Seattle, WA: University of Washington Press.

———. 2019. “A Meta-Synthesis of Agency in Game Studies. Trends, Troubles, Trajectories.” *G|A|M|E Games as Art, Media, Entertainment* 1 (8). https://www.gamejournal.it/a-meta-synthesis-of-agency-in-game-studies-trends-troubles-trajectories-s-c-jennings/.

———. 2022. “Only You Can Save the World (of Videogames): Authoritarian Agencies in the Heroism of Videogame Design, Play, and Culture.” *Convergence* 28 (2): 320–44. https://doi.org/10.1177/13548565221079157.

Johnson, Daniel. 2015. “Animated Frustration or the Ambivalence of Player Agency.” *Games and Culture* 10 (6): 593–612. https://doi.org/10.1177/1555412014567229.

Johnson, Robin. 2018. “Technomasculinity and Its Influence in Video Game Production.” In *Masculinities in Play*, edited by Nicholas Taylor and Gerald Voorhees, 249–62. Palgrave Games in Context. Cham, Switzerland: Palgrave Macmillan.

Jørgensen, Kristine. 2017. “Emphatic and Ecological Sounds in Gameworld Interfaces.” In *The Routledge Companion to Screen Sound*, edited by Miguel Mera, Ronald Sadoff, and Ben Winters, 72–84. London; New York, NY: Routledge. https://bora.uib.no/bora-xmlui/bitstream/handle/11250/2738934/Jorgensen_Ch6-ScreenSound.pdf.

Jørgensen, Kristine, and Faltin Karlsen, eds. 2018. *Transgression in Games and Play*. Cambridge, MA: MIT Press.

Kafai, Yasmin B., Gabriela T. Richard, and Brendesha M. Tynes. 2017. “The Need for Intersectional Perspectives and Inclusive Designs in Gaming.” In *Diversifying Barbie and Mortal Kombat: Intersectional Perspectives and Inclusive Designs in Gaming*, edited by Yasmin B. Kafai, Gabriela T. Richard, and Brendesha M. Tynes, 1–22. Pittsburgh: ETC Press.

Kagen, Melissa. 2017. “Walking Simulators, #GamerGate, and the Gender of Wandering.” In *The Year’s Work in Nerds, Wonks, and Neocons*, edited by Jonathan Eburne and Benjamin Schreier. Bloomington, IN: Indiana University Press. https://www.melissakagen.com/_files/ugd/2dae05_0ba7959bb6e8402aaffa05a64ea836be.pdf.

———. 2018. “Walking, Talking and Playing with Masculinities in Firewatch.” *Game Studies* 18 (2). http://gamestudies.org/1802/articles/kagen.

Kallio, Kirsi Pauliina, Frans Mäyrä, and Kaipainen Kirsikka. 2011. “At Least Nine Ways to Play: Approaching Gamer Mentalities.” *Games and Culture* 6 (4): 327–53. https://doi.org/10.1177/1555412010391089.

Keever, Justin. 2022. “Videogames and the Technicity of Ideology: The Case for Critique.” *Game Studies* 22 (2). http://gamestudies.org/2202/articles/gap_keever.

Keogh, Brendan. 2014. “Cybernetic Memory and the Construction of the Posthuman Self in Videogame Play.” In *Design, Mediation, and the Posthuman*, edited by

Dennis M. Weiss, Amy D. Propen, and Colby E. Reid, 233–47. London: Lexington Books.

———. 2018. *A Play of Bodies: How We Perceive Videogames*. Cambridge, MA: MIT Press.

Keogh, Brendan, and Ingrid Richardson. 2018. "Waiting to Play: The Labour of Background Games." *European Journal of Cultural Studies* 21 (1): 13–25. https://doi.org/10.1177/1367549417705603.

Kocurek, Carly A. 2018. "Play, Things: Games, Materialism, and the Production of Culture." *The Velvet Light Trap*, The Futures of Game Studies, 81 (1): 66–69.

Konami. 1987. *Metal Gear*. Microsoft Windows NES emulator.

———. 1998. *Suikoden II*. PlayStation.

Krzywinska, Tanya, and Douglas Brown. 2015. "Games, Gamers and Posthumanism." In *The Palgrave Handbook of Posthumanism in Film and Television*, edited by Michael Hauskeller, Thomas D. Philbeck, and Curtis D. Carbonell, 192–202. London: Palgrave Macmillan. https://doi.org/10.1007/978-1-137-43032-8_20.

Kwapiński, Adam. 2018. *Nemesis*. Awaken Realms.

Lammes, Sybille. 2007. "Approaching Game-Studies: Towards a Reflexive Methodology of Games as Situated Cultures." In *Situated Play: Proceedings of the 2007 International DiGRA Conference*. Tokyo, Japan. http://www.digra.org/wp-content/uploads/digital-library/07311.28016.pdf.

Lammes, Sybille, and Stephanie de Smale. 2018. "Hybridity, Reflexivity and Mapping: A Collaborative Ethnography of Postcolonial Gameplay." *Open Library of Humanities* 4 (1). https://doi.org/10.16995/olh.290.

LaPensée, Elizabeth. 2017. "Relationality in Indigenous Food and Medicine Games." *Resilience: A Journal of the Environmental Humanities* 4 (2–3): 191–200. https://doi.org/10.5250/resilience.4.2-3.0191.

Latour, Bruno. 1999. "On Recalling ANT." *The Sociological Review* 47 (1): 15–25. https://doi.org/10.1111/j.1467-954X.1999.tb03480.x.

Leino, Olli Tapio. 2010. "Emotions in Play: On the Constitution of Emotion in Solitary Computer Game Play." Doctoral dissertation, Copenhagen: IT University of Copenhagen. https://en.itu.dk/-/media/EN/Research/PhD-Programme/PhD-defences/2010/Olli-Thesispdf.pdf.

———. 2012. “Death Loop as a Feature.” *Game Studies* 12 (2). http://gamestudies.org/1202/articles/death_loop_as_a_feature.

Lipkin, Nadav. 2022. “Indie Games.” In *Encyclopedia of Ludic Terms*, edited by Pawel Grabarczyk, spring 2022 edition. https://eolt.org/articles/indie-games.

Lyon, David. 2018. *The Culture of Surveillance*. Cambridge: Polity Press.

Magnet, Shoshana Amielle. 2011. *When Biometrics Fail: Gender, Race, and the Technology of Identity*. Durham, NC: Duke University Press.

Mäyrä, Frans. 2015. “Preface.” In *Game Research Methods: An Overview*, edited by Petri Lankoski and Staffan Björk. ETC Press. http://press.etc.cmu.edu/content/game-research-methods-overview.

McGonigal, Jane. 2011. *Reality Is Broken. Why Games Make Us Better and How They Can Change the World*. New York, NY: The Penguin Press.

Mckeown, Conor. 2021. “‘What Kind of Cop Are You?’: Disco Elysium ’s Technologies of the Self within the Posthuman Multiverse.” *Baltic Screen Media Review* 9 (December): 68–79. https://doi.org/10.2478/bsmr-2021-0007.

Melnic, Diana, and Vlad Melnic. 2018. “Shortcut to Posthumanism: Decentring Elements of the Gaming Experience.” Edited by Carmen Borbély and Petronia Popa Petrar. *Caietele Echinox*, Posthumanist Configurations, 34: 167–80. https://doi.org/10.24193/cechinox.2018.34.13.

Mueller, Florian “Floyd,” Tuomas Kari, Zhuying Li, Yan Wang, Yash Dhanpal Mehta, Josh Andres, Jonathan Marquez, and Rakesh Patibanda. 2020. “Towards Designing Bodily Integrated Play.” In *Proceedings of the Fourteenth International Conference on Tangible, Embedded, and Embodied Interaction*, 207–18. Sydney NSW Australia: ACM. https://doi.org/10.1145/3374920.3374931.

Mukherjee, Souvik. 2017. *Videogames and Postcolonialism: Empire Plays Back*. Cham, Switzerland: Palgrave Macmillan.

Muriel, Daniel, and Garry Crawford. 2020. “Video Games and Agency in Contemporary Society.” *Games and Culture* 15 (2): 138–57. https://doi.org/10.1177/1555412017750448.

Murray, Soraya. 2018. “The Work of Postcolonial Game Studies in the Play of Culture.” *Open Library of Humanities* 4 (1). https://doi.org/10.16995/olh.285.

Next Games. 2018. *The Walking Dead: Our World*. Android.

Niantic. 2016. *Pokémon Go*. Android.

Nintendo. 2006. *The Legend of Zelda: Twilight Princess*.

No Code. 2019. *Observation*. PlayStation 4. Devolver Digital.

Phillips, Amanda. 2020. *Gamer Trouble: Feminist Confrontations in Digital Culture*. New York, NY: NYU Press.

PlatinumGames. 2017. *NieR: Automata*. PlayStation 4. Square Enix.

PlayGen Ltd. 2017. *Face Your Feelings*. Android.

Pötzsch, Holger. 2015. "Selective Realism: Filtering Experiences of War and Violence in First- and Third-Person Shooters." *Games and Culture* 12 (2): 156–78. https://doi.org/10.1177/1555412015587802.

Rare. 1997. *GoldenEye 007*. Microsoft Windows N64 emulator. Nintendo.

Raw Fury. 2019. *Whispers of a Machine*. Microsoft Windows. Clifftop Games.

Rettberg, Jill Walker. 2017. "Machine Vision in Everyday Life: Playful Interactions with Visual Technologies in Digital Art, Games, Narratives and Social Media." ERC Consolidator Grant 2017 Research proposal, Part B1. 2017. https://www.uib.no/sites/w3.uib.no/files/attachments/partb1_machinevision.pdf.

———. 2019. "Et algoritmisk blikk: Algoritmers rolle i produksjonen av hverdagsfotografier [Seeing through algorithms: The algorithmic production of everyday photographs]." *Norsk medietidsskrift* 26 (01): 1–20. https://doi.org/10.18261/ISSN.0805-9535-2019-01-03.

Rettberg, Jill Walker, Marianne Gunderson, Linda Kronman, Ragnhild Solberg, and Linn Heidi Stokkedal. 2019. "Mapping Cultural Representations of Machine Vision: Developing Methods to Analyse Games, Art and Narratives." In *Proceedings of the 30th ACM Conference on Hypertext and Social Media - HT '19*, 97–101. Hof, Germany: ACM Press. https://doi.org/10.1145/3342220.3343647.

Rettberg, Jill Walker, Linda Kronman, Ragnhild Solberg, Marianne Gunderson, Stein Magne Bjørklund, Linn Heidi Stokkedal, Gabriele De Seta, Kurdin Jacob, and Annette Markham. 2022. "A Dataset Documenting Representations of Machine Vision Technologies in Artworks, Games and Narratives." DataverseNO. https://doi.org/10.18710/2G0XKN.

Rettberg, Jill Walker, Linda Kronman, Ragnhild Solberg, Marianne Gunderson, Stein Magne Bjørklund, Linn Heidi Stokkedal, and Kurdin Jacob. 2021. “Machine Vision in Art, Games and Narratives.” Research database. 2021. https://machine-vision.no/.

Rettberg, Jill Walker, Linda Kronman, Ragnhild Solberg, Marianne Gunderson, Stein Magne Bjørklund, Linn Heidi Stokkedal, Kurdin Jacob, Gabriele de Seta, and Annette Markham. 2022. “Representations of Machine Vision Technologies in Artworks, Games and Narratives: A Dataset.” *Data in Brief* 42. https://doi.org/10.1016/j.dib.2022.108319.

Rockstar North. 2003. *Manhunt*. Microsoft Windows. Rockstar Games.

Ruberg, Bo. 2022. “After Agency: The Queer Posthumanism of Video Games That Cannot Be Played.” *Convergence* 28 (2): 413–30. https://doi.org/10.1177/13548565221094257.

Ruffino, Paolo. 2020. “Nonhuman Games: Playing in the Post-Anthropocene.” In *Death, Culture and Leisure: Playing Dead*, edited by Matt Coward-Gibbs, 11–25. Emerald Studies in Death and Culture. Bingley, UK: Emerald Publishing Limited. doi:10.1108/978-1-83909-037-020201008.

———. 2022. “There Is No Cure: Paratexts as Remediations of Agency in Red Dead Redemption 2.” *Convergence* 28 (2): 345–58. https://doi.org/10.1177/13548565221081062.

Schmierbach, Mike. 2009. “Content Analysis of Video Games: Challenges and Potential Solutions.” *Communication Methods and Measures* 3 (3): 147–72. https://doi.org/10.1080/19312450802458950.

Seller, Merlin. 2022. “Sensing Sims: Atmospheres, Aesthetics and the Cyborg Player.” In *Materializing Digital Futures: Touch, Movement, Sound and Vision*, edited by Toija Cinque and Jordan Beth Vincent. New York, NY: Bloomsbury Academic.

Shaw, Adrienne. 2018. “Are We There Yet? The Politics and Practice of Intersectional Game Studies.” *The Velvet Light Trap*, The Futures of Game Studies, 81 (1): 76–80.

Shaw, Adrienne, Evan W. Lauteria, Hocheol Yang, Christopher J. Persaud, and Alayna M. Cole. 2019. “Counting Queerness in Games: Trends in LGBTQ Digital Game Representation, 1985-2005.” *International Journal of Communication* 13: 1544–69.

Sherif, Victoria. 2018. “Evaluating Preexisting Qualitative Research Data for Secondary Analysis.” *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research* 19 (2). https://doi.org/10.17169/FQS-19.2.2821.

Solberg, Ragnhild. 2021. “Hologrammer i Grenseland: Ikke-menneskelige Aktørers Tilstedeværelse Og Handlingsrom i Spill [Holograms in the Borderlands: Non-Human Presence and Agency in Games].” *Norsk Medietidsskrift* 28 (4): 1–20. https://doi.org/10.18261/issn.0805-9535-2021-04-03.

———. 2021b. “Playing Posthumanism? NieR: Automata and the Inescapable Human.” Presented at the European Society for Literature, Science and the Arts: 15th SLSAeu Conference, Bergen, Norway/online, March 4. https://doi.org/10.33767/osf.io/crz8g.

———. 2022. “(Always) Playing the Camera: Cyborg Vision and Embodied Surveillance in Digital Games.” *Surveillance & Society* 20 (2). https://doi.org/10.24908/ss.v20i2.14517.

Sony Computer Entertainment Japan. 2002. *Surveillance Kanshisha*. PlayStation 2.

———. 2003. *Lifeline*. PlayStation 2.

Spellbound Entertainment. 2001. *Desperados: Wanted Dead or Alive*. Microsoft Windows.

Square Enix. 2020. *Final Fantasy VII Remake*. PlayStation 4.

Sundén, Jenny. 2009. “Play as Transgression: An Ethnographic Approach to Queer Game Cultures.” In *DiGRA ’09 - Proceedings of the 2009 DiGRA International Conference*. Vol. 5. Brunel University, UK. http://www.digra.org/wp-content/uploads/digital-library/09287.40551.pdf.

Taylor, T.L. 2009. “The Assemblage of Play.” *Games and Culture* 4 (4): 331–39. https://doi.org/10.1177/1555412009343576.

———. 2018. *Watch Me Play: Twitch and the Rise of Game Live Streaming*. Princeton Studies in Culture and Technology. Princeton and Oxford: Princeton UP.

Team Junkfish. 2015. *Monstrum*. Microsoft Windows. Junkfish Limited.

Tender Claws. 2018. *Tendar*. Android.

Tolkien, J.R.R. 2004. *The Lord of the Rings*. Boston and New York: Houghton Mifflin Company.

Trammell, Aaron. 2022. “Decolonizing Play.” *Critical Studies in Media Communication*. https://doi.org/10.1080/15295036.2022.2080844.

Ubisoft. 2018. *Just Dance 2019*. PlayStation 4.

Ubisoft Montréal. 2013. *Assassin’s Creed IV: Black Flag*. PlayStation 3. Ubisoft.

———. 2015. *Tom Clancy’s Rainbow Six Siege*. Microsoft Windows. Ubisoft.

Ubisoft Toronto. 2020. *Watch Dogs: Legion*. PlayStation 4. Ubisoft.

United Front Games. 2012. *Sleeping Dogs*. Microsoft Windows. Square Enix.

Van de Mosselaer, Nele, and Stefano Gualeni. 2020. “The Implied Designer and the Experience of Gameworlds.” In *Proceedings of the 2020 DiGRA International Conference*. Tampere, Finland. http://www.digra.org/digital-library/publications/the-implied-designer-and-the-experience-of-gameworlds/.

Vella, Daniel. 2015. “The Ludic Subject and the Ludic Self: Analyzing the ‘I-in-the-Gameworld.’” Doctoral dissertation, IT University of Copenhagen.

———. 2017. “Action as the Basis for an Aesthetics of Ludic Subjectivity.” Conference paper presented at the The Philosophy of Computer Games Conference: Action in Computer Games, Krakow, Poland. http://gamephilosophy.org/wp-content/uploads/confmanuscripts/pcg2017/Vella%20%20-%202017%20-%20Action%20as%20the%20basis%20for%20an%20aesthetics%20of%20ludic%20subjectivity.pdf.

Ven, Ruben van de. 2016. *Emotion Hero*. Android.

Verbeek, Peter-Paul. 2005. *What Things Do: Philosophical Reflections on Technology, Agency, and Design*. University Park, PA: Pennsylvania State University Press.

———. 2008. “Cyborg Intentionality: Rethinking the Phenomenology of Human–Technology Relations.” *Phenomenology and the Cognitive Sciences* 7 (3): 387–95. https://doi.org/10.1007/s11097-008-9099-x.

Vist, Elise. 2015. “Cyborg Games: Videogame Blasphemy and Disorientation.” *Loading... The Journal of the Canadian Game Studies Association* 9 (14): 55–69.

Vogt, W. Paul, and R. Burke Johnson. 2005. *Dictionary of Statistics and Methodology: A Nontechnical Guide for the Social Sciences*. Thousand Oaks, CA: SAGE.

Vysotsky, Stanislav, and Jennifer Helen Allaway. 2018. “The Sobering Reality of Sexism in the Video Game Industry.” In *Woke Gaming: Digital Challenges to Oppression and Social Injustice*, edited by Kishonna L. Gray and David J. Leonard, 101–18. Seattle, WA: University of Washington Press.

Wilde, Poppy. 2020. “I, Posthuman: A Deliberately Provocative Title.” *International Review of Qualitative Research* 13 (3): 365–80. https://doi.org/10.1177/1940844720939853.

Wilde, Poppy, and Adrienne Evans. 2019. “Empathy at Play: Embodying Posthuman Subjectivities in Gaming.” *Convergence* 25 (5–6): 791–806. https://doi.org/10.1177/1354856517709987.

Wildt, Lars de, Thomas H. Apperley, Justin Clemens, Robbie Fordyce, and Souvik Mukherjee. 2019. “(Re-)Orienting the Video Game Avatar.” *Games and Culture* 15 (8). https://doi.org/10.1177/1555412019858890.

Willumsen, Ea Christina. 2021. “The PO-VE Framework: Understanding the Relationships Between Player Objects and Virtual Environments in Digital Games.” Doctoral dissertation, University of Bergen. https://bora.uib.no/bora-xmlui/bitstream/handle/11250/2823326/archive.pdf.

ZA/UM. 2019. *Disco Elysium*. Microsoft Windows.

Zuboff, Shoshana. 2019. *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power*. London: Profile Books.

Appendices

The play log

Title	Platform	Type of play
>observer_	PlayStation 4	Partial completion
AI: The Somnium Files	-	Non-playing analysis
Alien: Blackout	Android	Partial completion
Assassin's Creed IV: Black Flag	PlayStation 3	Partial completion
Astral Chain	Nintendo Switch	Partial completion
Batman: Arkham Knight	Microsoft Windows	Partial completion
Before Your Eyes	Microsoft Windows / Tobii Eye Tracker 4	Total completion
Beholder	Microsoft Windows	Total completion
Big Brother is Shaping You	Microsoft Windows	Total completion
Borderlands 3	Microsoft Windows	Partial completion
Call of Duty 4: Modern Warfare	Microsoft Windows	Partial completion
Clandestine	Microsoft Windows	Light play
Cyberpunk 2077	Microsoft Windows	Total completion
Death Stranding	PlayStation 4	Partial completion
Den Lengste Reisen	Microsoft Windows	Total completion
Detroit: Become Human	PlayStation 4	Total completion
Deus Ex: Human Revolution	Microsoft Windows	Partial completion
Do Not Feed the Monkeys	Microsoft Windows	Total completion
Don't Look	Microsoft Windows / Tobii Eye Tracker 4	Total completion
Duke Nukem 3D	Microsoft DOS emulator for Windows	Light play
Emotion Hero	Android	Light play
eXperience112	Microsoft Windows	Partial completion
Face Your Feelings	Android	Light play
Final Fantasy VII Remake	PlayStation 4	Total completion
Five Nights at Freddy's	Microsoft Windows	Partial completion
Get Even	Microsoft Windows	Partial completion
Grand Theft Auto V	PlayStation 4	Partial completion
Hacker	Microsoft DOS emulator for Windows	Total completion
Half-Life 2	Microsoft Windows	Partial completion
Halo: Combat Evolved	Xbox One	Total completion
Heavy Rain	PlayStation 3	Total completion
Heroes of the Storm	Microsoft Windows	Repeated play

Horizon Zero Dawn	PlayStation 4	Total completion
I'm on Observation Duty	Microsoft Windows	Total completion
In Other Waters	Microsoft Windows	Total completion
Just Dance 2019	PlayStation 4	Partial completion
Lifeline	-	Non-playing analysis
Manhunt	Microsoft Windows	Light play
Mass Effect: Andromeda	Microsoft Windows	Partial completion
Ministry of Broadcast	Microsoft Windows	Total completion
Neo Cab	Microsoft Windows	Total completion
NieR: Automata	PlayStation 4	Total completion
Night Trap	Microsoft Windows	Total completion
NITE Team 4	Microsoft Windows	Partial completion
Nothing to Hide	Microsoft Windows	Partial completion
Observation	PlayStation 4	Total completion
Orwell	Microsoft Windows	Total completion
Outlast	Microsoft Windows	Light play
Pokémon Go	Android	Partial completion
Portal	Microsoft Windows	Total completion
Remember Me	Microsoft Windows	Partial completion
République	Android	Total completion
Satellite Reign	Microsoft Windows	Partial completion
Scanner Sombre	Microsoft Windows / Oculus Quest	Total completion
Shutter	Microsoft Windows	Total completion
Spycraft	Microsoft Windows	Light play
Starcraft II: Wings of Liberty	Microsoft Windows	Total completion
State of Mind	Microsoft Windows	Total completion
Subnautica	Microsoft Windows	Partial completion
Surveillance Kanshisha	-	Non-playing analysis
Syndicate	Microsoft Windows	Partial completion
Tacoma	Microsoft Windows	Total completion
Technobabylon	Microsoft Windows	Partial completion
TendAR	Android	Light play
The Castle Doctrine	Microsoft Windows	Total completion
The Sims 4	Microsoft Windows	Repeated play
The Talos Principle	Microsoft Windows	Total completion
The Under Presents	Oculus Quest	Partial completion
The Walking Dead: Our World	Android	Light play
To the Moon	Microsoft Windows	Total completion
Tom Clancy's Ghost Recon Wildlands	PlayStation 4	Light play
Tom Clancy's Rainbow Six Siege	Microsoft Windows	Light play

Unmanned	Microsoft Windows	Repeated play
Vigilance 1.0	Microsoft Windows	Total completion
Voyeur	Microsoft Windows	Total completion
Watch Dogs: Legion	PlayStation 4	Total completion
Whispers of a Machine	Microsoft Windows	Total completion

Individual contributions to the Database of Machine Vision in Art, Games and Narratives

The Database of Machine Vision in Art, Games and Narratives was developed as part of the project Machine Vision in Everyday Life: Playful Interactions with Visual Technologies in Digital Art, Games, Narratives and Social Media, which received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (ERC CoG, grant agreement No 771800).

Please cite database as:

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The dataset is also deposited as csv files with metadata and can be cited as follows:

Rettberg, Jill Walker; Kronman, Linda; Solberg, Ragnhild; Gunderson, Marianne; Bjørklund, Stein Magne; Stokkedal, Linn Heidi; de Seta, Gabriele; Jacob, Kurdin; Markham, Annette, 2022, "A Dataset Documenting Representations of Machine Vision Technologies in Artworks, Games and Narratives", https://doi.org/10.18710/2G0XKN, DataverseNO.

Detailed description of contributions: The core team consisted of Jill Walker Rettberg, Ragnhild Solberg, Linda Kronman and Marianne Gunderson, with Stein Magne Bjørklund as the developer. Rettberg initiated the project and led development. The core team contributed equally to the conceptual development of the database structure and analytical models, although Solberg and Gunderson came up with the specific idea of using active and passive verbs as a solution to the problem of how to analyse agency across many works without falling into an anthropocentric binary concept of humans simply using technologies as tools. Several other people contributed both to the conceptual and practical sides of the database development.

The table below documents how many entries were created by each person, but it should be noted that the core team also edited and revised many entries, especially

those first entered by assistants. Our main research assistants contributed a lot, but many of their listed entries were done on behalf of a core team member and edited by the core team. Additionally, the numbers are only indicative of a researcher's time and investment, because there are large variations between different creative works' length and detail.

Table 1: Contributions by each team member.

Contributor	**Created database entries**	**Notes**
Jill Walker Rettberg	123 situations 61 creative works 58 creators 119 characters	Conceptualization, Methodology, Investigation, Data curation, Supervision, Project Administration, Funding acquisition. Prepared dataset for archiving with Stein Magne Bjørklund and support from Jenny Ostrup. Mostly entered novels, movies, e-lit.
Ragnhild Solberg	192 situations 92 creative works 83 creators 200 characters	Methodology, Investigation, Data collection, Data curation, Data analysis. Core team (2019-), specializing on games. Entered almost all games and verified all game entries, as well as contributing to narratives. Developed idea of using verbs and agents with Gunderson, this was then further developed by the core team.
Marianne Gunderson	41 situations 24 creative works 25 creators 45 characters	Methodology, Investigation, Data collection, Data curation, Data analysis. Core team (2019-), specializing on narratives. Mostly entered novels, creepypasta, short stories, comics. Developed idea of using verbs and agents with Solberg, this was then further developed by the core team.
Linda Kronman	149 situations 78 creative works 80 creators 64 characters	Methodology, Investigation, Data collection, Data curation, Data analysis. Core team (2019-), specializing on digital art. Coordinated artworks in database, which includes identifying and analysing works that Jacob entered basic details for. Recruited and coordinated with two experts, Graziele Lautenschlaeger and Diana Arce, who identified works to increase diversity.

Linn Heidi Stokkedal	40 situations 113 creative works 25 creators 45 characters	Research assistant (2018-2020). Methodology, Investigation, Data collection, Project Administration. Mostly entered TV series, artworks, music videos.
Kurdin Jacob	63 creative works 52 creators	Research assistant (Aug 2020-Jan 2021). Investigation, Data curation, Project Administration. Mostly entered artworks sourced by Kronman.
Gabriele de Seta	9 situations 7 creative works 7 creators 8 characters	Post.doc. (Jan 2020-). Not primarily working on the database but contributed to discussions about analysis and methodologies. Investigation, Data collection, Project administration.
Annette Markham	3 situations 1 creative work 1 person 2 characters	Advisory board member. Methodology, Data analysis. Contributed to initial methodology and data structure and participated in development of analysis model.
Edward Svihus	11 situations 7 creative works 6 creators 10 characters	Data collection. The “sci-fi team” was a group of 10 students hired for 40 hours each in Oct/Nov 2020 to find, read/watch, analyse and enter science fiction novels and movies, both to ensure inclusion of recent award-winners and to increase cultural diversity.
Milosz Waskiewicz	29 situations 7 creative works 7 creators 27 characters	
Tijana Przulj	33 situations 5 creative works 7 creators 15 characters	
Hang On Martin Li	15 situations 4 creative works 2 creators 14 characters	
Cecilie Thale Klingenberg	8 situations 5 creative works 4 creators 16 characters	
Milad Shahpary	16 situations 5 creative works 6 creators 23 characters	
Amanda Hersvik	12 situations	

	5 creative works 9 creators 19 characters	
Ida Otilde Haugland	10 situations 3 creative works 3 creators 8 characters	
Sunniva Eirin Sandvik	14 situations 6 creative works 7 creators 10 characters	
Ainsley Belle Retzius	35 situations 11 creative works 10 creators 28 characters	
Andrés	6 situations 2 creative works 2 creators	Volunteer, worked with sci-fi team. Data collection.
Anne Karhio	1 character 1 creative work 1 creator	Researcher on project in 2018. Data collection.
Stein Magne Bjørklund	Developer	Software. Set up and managed database in Drupal, contributed to discussions about database structure and customized the database to fit research goals. Created data exports.

All four core team members agree upon this description of each person's contributions.

Signed, April 27, 2022,




Jill Walker Rettberg	Ragnhild Solberg	Marianne Gunderson	Linda Kronman
Chicago	Trondheim	Bergen	Graz

The articles

Article I

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Data Article

Representations of machine vision technologies in artworks, games and narratives: A dataset

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ABSTRACT

This data paper documents a dataset that captures cultural attitudes towards machine vision technologies as they are expressed in art, games and narratives. The dataset includes records of 500 creative works (including 77 digital games, 190 digital artworks and 233 movies, novels and other narratives) that use or represent machine vision technologies like facial recognition, deepfakes, and augmented reality. The dataset is divided into three main tables, relating to the works, to specific situations in each work involving machine vision technologies, and to the characters that interact with the technologies. Data about each work include title, author, year and country of publication; types of machine vision technologies featured; topics the work addresses, and sentiments shown towards machine vision in the work. In the various works we identified 874 specific situations where machine vision is central. The dataset includes detailed data about each of these situations that describes the actions of human and non-human agents, including machine vision

Abbreviations: DH, Digital Humanities; Sci-fi, Science fiction.

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technologies. The dataset is the product of a digital humanities project and can be also viewed as a database at http://machine-vision.no. Data was collected by a team of topic experts who followed an analytical model developed to explore relationships between humans and technologies, inspired by posthumanist and feminist new materialist theories. The dataset is particularly useful for humanities and social science scholars interested in the relationship between technology and culture, and by designers, artists, and scientists developing machine vision technologies.

Specifications Table

Subject	Humanities (General)
Specific subject area	Digital Humanities, Digital Culture, Art History, Game Studies, Media Studies, Literary Studies, Science and Technology Studies, Visual Studies
Type of data	Text, table.
How data were acquired	Data were generated by a team of topic experts who qualitatively selected and analysed relevant artworks, games and narratives (e.g. movies and novels). An analytical model was developed to describe relationships between technologies and human and nonhuman agents in the artworks, games and narratives, and the model was encoded in a Drupal database. Descriptive and interpretative data about each work was identified and logged in the database according to the analytical model. Data were then exported from the database in csv format.
Data format	Raw, Filtered
Description of data collection	The project identified relevant works by searching databases, visiting exhibitions and conferences, reading scholarship, and consulting other experts. The inclusion criteria were creative works (art, games, narratives) where one of the machine vision technologies listed in Table 2: Table 3 was used in or represented by the work. The collection happened between January 2019 and September 2021.
Data source location	The primary data sources are the actual creative works, which are not included in this dataset. The dataset consists of secondary data documenting and analysing the primary data. A complete list of the primary data sources can be found in creativeworks.csv. Narratives include: • Published novels and short stories • Movies and TV series screened at cinemas or film festivals and available on public broadcasting or commercial streaming services • Written narratives, such as fan fiction, creepypasta, short stories and electronic literature published in online journals, websites or public forums • Electronic literature published online or presented in public exhibitions • Music videos with strong narrative elements Games include: • Video games available for purchase or download in stores or on platforms such as Steam Artworks include: • Artworks publicly displayed in exhibitions or online
Data accessibility	Repository name: UiB Open Research Data / DataverseNO Data identification number: doi: 10.18710/2G0XKN Direct URL to data: 10.18710/2G0XKN

(*continued on next page*)

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Value of the Data

- The dataset documents how machine vision technologies are imagined in the highly influential cultural discourses of narratives, art, and games.
- These data are primarily useful to scholars in disciplines such as Digital Culture, Digital Humanities, Science and Technology Studies, Literary Studies, Media Studies, Game Studies and Visual Studies. They could also be useful for designers, artists and scientists developing machine vision technologies.
- The data can be reused for humanities and social science-based research on machine vision, and to compare and contrast representations of technologies versus actual development and widespread use of technologies.
- The data combines interpretative and descriptive categories and focuses on features, characteristics and actions that can generate further research questions.
- The analytical model and database structure used to capture cultural representations of technology may be useful for other projects that seek to register and analyse large amounts of cultural data that cannot be easily segmented into clearly defined categories.

1. Data Description

The dataset includes data describing 77 games, 190 artworks and 233 narratives (in total 500 Creative Works) where machine vision technologies play an important role. The data are qualitative analyses by the research team, and were not automatically scraped or extracted from the Creative Works. The dataset that is described in this data paper can be downloaded from DataverseNO [1]. A static archive of the database the dataset was exported is also available as a set of HTML and CSS files that can be viewed in a web browser [2].

80% of the Works are from 2011 to 2021, and just over half from 2016 to 2021. 34 works were published between 1891 and 1999. Fig. 1 shows the distribution of the 464 works published in 2000 or later by year.

The Creative Works are from 59 different countries, with 78,6% from North America and Europe, and 21,4% from other parts of the world. As shown in Fig. 2, narratives (especially movies, novels and TV-series) are more heavily biased towards English-speaking countries, while art-

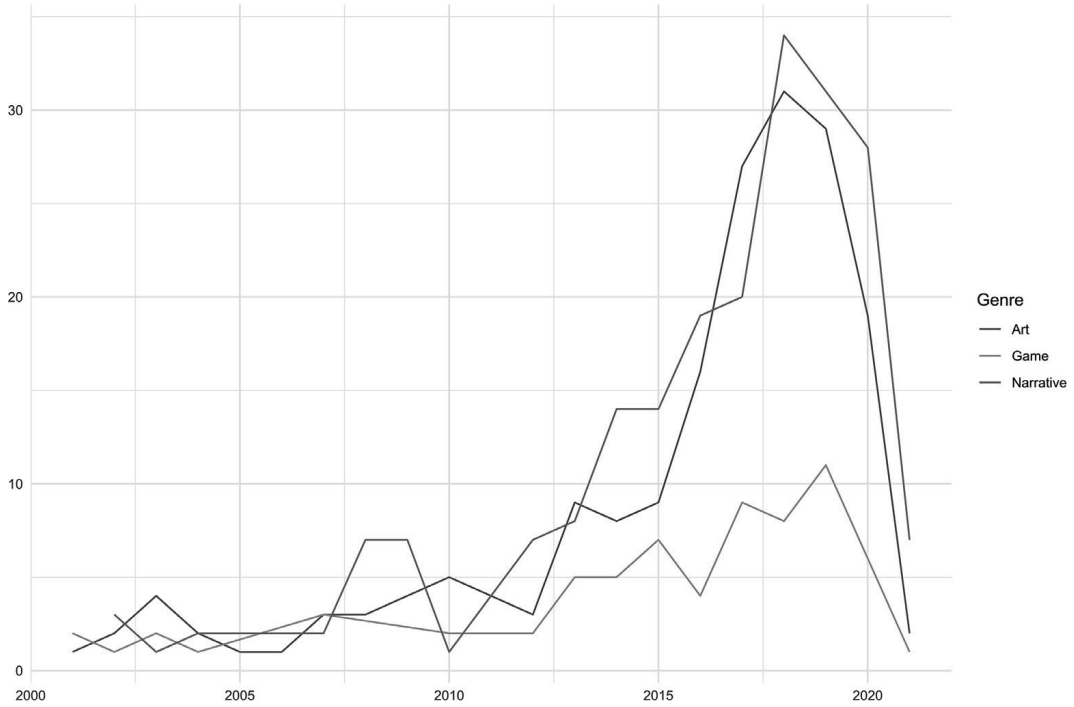

Fig. 1. Year of publication for creative works. The 34 works published before 2000 are not included in this figure. The R code used to generate this and the other figures in this paper is available at Github [3].

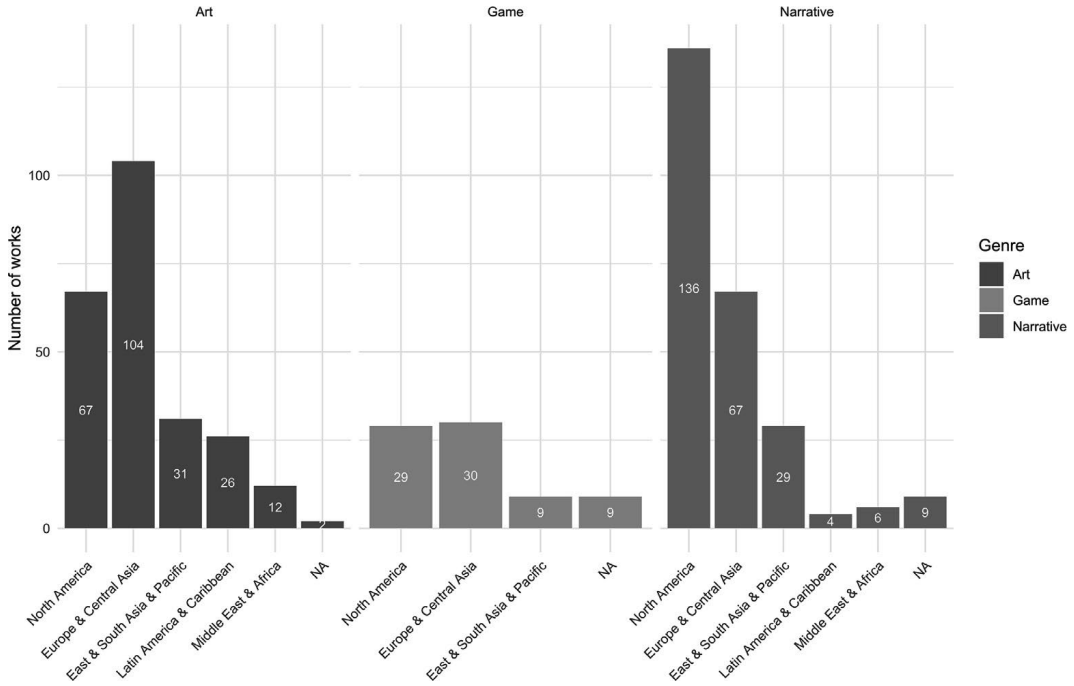

Fig. 2. Geographic distribution of creative works. Note that some works are affiliated with more than one country, so the total is more than 500. Regions are grouped by the seven regions of the World Bank's Economic Indicators. NA refers to works lacking information about an affiliated country.

Table 1
Files included in the dataset. 00_README.txt is a plain text file, and machinevisionscripts.R is a text file containing scripts that can be run in the programming language R. All other files are csv files encoded in UTF-8.

Filename	Content	Data structure
00_README.txt	Plain text description of the dataset.	Plain text. Describes the files and includes a list of all 500 works in the dataset.
01_codebook.csv	Lists variables used in the different data files with definitions and information about which variables are included in each file.	Variable, Description, PossibleValues, MultiplesPossible, and a column for each of the other files in the dataset indicating whether a variable is included in the file.
02_technologies_sentiments_topics_definitions.csv	Lists definitions of each of the technologies, sentiments and topics.	Term, Type, Definition
creativeworks.csv	Lists data describing each of the 500 Creative Works in the dataset.	WorkID, WorkTitle, Year, Country, Genre, TechRef, TechUsed, Topic, Sentiment, Situation, SituationID, Character, CharacterID
situations.csv	Lists situations involving machine vision technologies in the Creative Works with details about the actions of humans, technologies, and other agents.	SituationID, Situation, Genre, Character, Entity, Technology, Verb
characters.csv	Lists all Characters that interact with machine vision with fields describing how they are represented in the Creative Work.	CharacterID, Character, Species, Gender, RaceOrEthnicity, Age, Sexuality, IsGroup, IsCustomizable
narrativegenres.csv	Lists genres of Creative Works that have been classified as Narratives.	WorkID, WorkTitle, Genre (Movie, Novel, Short story, TV series or episode, Fan fiction, Creepypasta, Comic, Electronic Literature, Music Video, Online Video)
situation_description.csv	Written descriptions of each situation and quotations from texts where available.	SituationID, Situation, SituationDescription, SituationQuotes
situations_visual.csv	Lists colours and aesthetic characteristics of situations, when relevant. Notes whether situation is shown from the machine's point of view.	SituationID, Situation, Colours, AestheticCharacteristics, MachinePOV
creators.csv	Lists all creators (authors, artists, producers) of works with Wikidata IDs where available.	Creator, Creator_WikidataID
worksinfo.csv	Bibliographic data about each creative work, including Wikidata Q IDs when available to enable interoperability.	WorkID, Variable and Value. Variables include WorkTitle, Year, Genre, Creator, URL, Country, Work_WikidataID, IsSciFi.
machinevisionscripts.R	Scripts to load data files with levels in R, to join data files, merge categories, create contingency tables that show the count of occurrences instead of a list of each occurrence, and transform worksinfo.csv to a wide, more human-friendly table.	R scripts. These can be run in R or RStudio or viewed in a text editor.

works and games are more evenly spread. Attempts to mitigate the bias are described in the discussion of the selection process below.

The three main files contain information about Creative Works, Situations, Characters (see Table 1). The data are exported from a relational database (http://machine-vision.no) we developed for the project, as described in the methodology section below.

The data are represented in a two-dimensional comma separated table with a separate row for each unique combination of values. Since the *creativeworks.csv* and *situations.csv* files have

multiple values for several variables, with a separate row for each combination of values, care must be taken to remove duplicate values before doing any frequency analysis. See Tables 3 and 4 and the accompanying explanation for more details on the formats.

In the following, we describe the three main categories of data: creative works, situations and characters and how they relate to each other. We then describe the methodology in the next section.

1.1. Machine Vision Technologies

Before describing the files it is useful to understand which technologies the dataset focuses on. Based on our initial survey of Creative Works, we selected 26 technologies that were commonly referenced or used.

Table 2 lists the technologies with the definitions we used when coding the data. The definitions are cultural definitions developed by the project team to align with the way the technologies are portrayed in Creative Works and are not intended to be technically precise.

1.2. Creative Works

The first level of analysis is that of the works, that is of the novels, movies, videogames, artworks and so on in our sample. *Creativeworks.csv* includes four data types about each of the 500 Creative Works: provenance, content description, sentiment, and identification of situation. *Provenance* includes the fields Title, Year, Genre, and country of origin. *Content description* includes machine vision technologies referenced (TechRef), machine technologies used (TechUsed), topics (subject matter) and characters who interact with machine vision technologies in the work. The identification of sentiment, which is qualitative and interpretive rather than descriptive or computationally inferred data, encapsulates attitudes towards machine vision technologies as they are represented in the Work. Situations identify selective situations within Works that involve machine vision technologies and demonstrate how agency is distributed between human and non-human actors (see Table 6: Fields in the file situations.csv. Table 6 for more details).

We have interpreted a "work" broadly, counting a whole TV series like *Black Mirror* as a single work and in some cases combining both a series of novels and the movie adaptations as a single work, as with *The Hunger Games*.

Several of the variables can have multiple values, as shown in Table 3, which presents just the TechRef and Sentiment variables for two creative works. For clarity, we have exported the data with a separate row for each unique combination of values, as shown in simplified form in Table 4.

This format makes it easy to create adjacency tables for network analysis between two values, or to select just the needed variables (columns) and values. However, it is important to realise that the format means that values are repeated.

Doing a frequency analysis on *creativeworks.csv* without filtering out duplicates will thus lead to vastly inflated and incorrect results. If you want to identify how common Facial Recognition is in movies, for instance, you need to filter out duplicate rows. As you can see in Table 4, Facial Recognition is listed three times for *Minority Report*. In the full dataset *creativeworks.csv* there are 442 rows just for *Minority Report*, and 72 rows include the value Facial Recognition. A work with more characters or situations will have many more rows than a work with only one situation and one character, because there will be so many more unique combinations of values. The TV series *Black Mirror* has the most rows in the dataset (26,880), while four works only have a single row each. Lauren McCarthy and Kyle McDonald's artwork *Vibe Check* is one of the single row works, as it only uses one technology (emotion recognition) and only has one sentiment assigned to it.

Table 2
Definitions of the Machine Vision technologies.

Technology	Definition
3D scans	3D images or models produced by surface scanning such as photogrammetry, LiDAR, 3D scanning, etc. Does not usually include holograms unless the surface scan that produced the hologram is presented as particularly important in the game.
AI	General purpose artificial intelligence systems that can perform a broad range of intellectual and cognitive tasks. A system that can only perform one task, such as facial recognition, video recommendations, conversations with humans, or playing a game, is not tagged as AI but as machine learning, if central to the work.
Augmented reality	Digital images overlay or appear to be integrated into a physical environment. Unlike holograms, glasses, implants or screens are usually required to view AR.
Biometrics	Technologies used to identify an individual. Can include retina scans, gait recognition, DNA phenotyping, fingerprint scans. Facial recognition is not included here but tagged separately.
Body scans	Any imaging technology that shows parts of the body that are usually hidden, for instance brain imaging, fMRI, ultrasound, x-ray, or body scans in airport security that show objects under clothing. Includes cameras probes that enter the body.
Camera	Single-purpose, portable camera technologies for creating a visual representation, e.g., camcorders, SLR cameras, cinema cameras. Does not include CCTV, satellites or cameras that are part of other technologies, such as webcams and camera phones, and does not include cameras that produce non-visual information such as motion tracking.
Cameraphone	Cameras integrated into phones that are easily carried on the person and often include computational capabilities.
Deepfake	Technologies that use machine learning to generate videos that strongly resemble a specific human being. For our purposes, we include for instance art, satire and spoofs, but not professional uses of synthetic or virtual actors in Hollywood movies.
Drones	Remote controlled or autonomous aerial vehicle with a camera. Does not carry a human operator.
Emotion recognition	Software that analyses facial expressions to infer a person's emotions and inner states of mind.
Facial recognition	Automated identification of identity based on a face. This could mean identifying a face as belonging to a specific individual, or to a gender, race or other category.
Filtering	Applying filters to an image to enhance or remove certain aspects, e.g., Instagram filters, beautifying filters, selfie lenses.
Hologram	A 3D projection of archived material or real-time events. It usually features humans, nonhumans or terrain and can usually be seen without special glasses, screens or implants.
Image generation	Synthetic images generated with the use of technologies such as GANs and other neural networks. Does not include animation in general.
Interactive panoramas	360 images of the real world that are stitched together to allow movement between photographed spots. Includes various street view services.
Machine learning	The capacity of a computer to learn from experience, i.e. to modify its processing based on newly acquired information. Includes neural networks and machine learning datasets.
Microscope/Telescope	Any kind of technology that allows us to see objects that are too small or too far away to be clearly viewed with the naked human eye. Can include rifle scopes if the zoom is quite strong.
Motion tracking	Technologies that register movements. Does not include GPS locations and other remote tracking.
Non-visible spectrum	Technologies designed to register objects, shapes and movements in low light conditions, often enhancing the spectral range, e.g. using night vision, infrared, near infrared and ultraviolet. Sources of light such as torches are not included.
Object recognition	Automated identification of an object using visual data. For our purposes, we do not include facial recognition, which has a separate tag. A fingerprint would be tagged with "Biometrics", but not "Object Recognition", despite the purely technical level being similar.

(*continued on next page*)

Table 2 (*continued*)

Technology	Definition
Ocular implant	An implant of some sort has been inserted into somebody's eyes or brain, usually providing enhanced vision, AR displays or recordings of all that is seen.
Satellite images	Images collected by a satellite. Includes Google Earth and many others.
Surveillance camera	CCTV, IP cameras, home surveillance cameras, baby monitors.
UGV	Remote controlled or autonomous ground vehicle with a camera. Does not carry a human operator. Can include autonomous vehicles and drones that work underground or underwater.
Virtual reality	Immersive experiences taking place in computer-generated simulated realities, usually involving headsets or similar equipment.
Webcams	Video cameras connected to personal computers that stream images in real time to the internet.

Table 3
A simplified table showing that a single Creative Work may have multiple values for some fields.

WorkTitle	TechRef	Sentiment
Minority Report	Augmented Reality, Biometrics, Facial Recognition	Hostile, Intrusive, Oppressive
Horizon Zero Dawn	AI, Augmented Reality, Biometrics, Holograms	Alien, Helpful, Intimate

Table 4
The file creativeworks.csv presents the data with a separate row for each unique set of values. This is a simplified extract showing how the Technologies Referenced and Sentiments are represented in the file.

WorkTitle	TechRef	Sentiment
Minority Report	Augmented Reality	Hostile
Minority Report	Biometrics	Hostile
Minority Report	Facial Recognition	Hostile
Minority Report	Augmented Reality	Intrusive
Minority Report	Biometrics	Intrusive
Minority Report	Facial Recognition	Intrusive
Minority Report	Augmented Reality	Oppressive
Minority Report	Biometrics	Oppressive
Minority Report	Facial Recognition	Oppressive
Horizon Zero Dawn	AI	Alien
Horizon Zero Dawn	Augmented Reality	Alien

When analysing the data you thus need to first select the variables you are interested in, then remove duplicates. To create the chart in Fig. 1 showing the years works were released, we used the following code in R to select the relevant variables, and then removed duplicate rows with the distinct() function. At that point we could safely plot the data without duplicates.

```
CreativeWorks %>%
  select(WorkID, Genre, Year) %>%
  distinct()
```

In Excel you would do this by deleting columns you do not need, then using the "Remove duplicates" tool on the Data toolbar. It is important to keep the WorkID column, or else removing duplicates will only keep the years and genres, and you will not know how they relate to the number of works.

1.3. Situations

Situations provide a second layer of data embedded within a Creative Work. A Situation captures granular details of what humans, technologies, and other agents are doing when machine

Table 5
Descriptions of the fields in creativeworks.csv.

Column header	Description	Multiple values possible
WorkID	A number that uniquely identifies the Creative Work in the dataset.	No
WorkTitle	The title of the work. Series and adaptations (e.g., novels made into movies) are logged as a single entry unless machine vision is presented very differently in the different episodes or versions.	No
Year	The year of publication. In the case of series and adaptations, the year when the first episode or version was published or released.	No
Genre	The genre that the Creative Work belongs to (Art, Game or Narrative).	No
Country	The main country or countries the creators of the work are affiliated with, for instance by citizenship or residency.	Yes
TechRef	Machine vision technologies described, represented or mentioned in the Creative Work. See Table 2 for a list of all 26 Technologies.	Yes
TechUsed	Machine vision technologies used by the Creative Work. Examples might include an artwork that uses facial recognition of museum visitors to generate a customised output, or a game that uses eye-tracking so that the player can interact with the game by blinking or moving their eyes. See Table 2 for a list of all 26 Technologies.	Yes
Topics	Topics that categorise the various Creative Works based on their explicit subject matters. A Topic is foregrounded and central in the Creative Work, with one Creative Work usually having up to five Topics. Topics are tagged with one or more of the following words: AI, Animals, Automation, Autonomous vehicles, City, Climate change, Companionship, Competition, Conflict, Consciousness, Crime, Cyborg, Dystopian, Economy, Empathy, Family, Free will, Gender, Grief, Hacking, Horror, Identity, Inequality, Labour, Nature, Nudity, Physical violence, Playful, Race and ethnicity, Robot/android, Romantic relationship, Sex, Social media, Surveillance, Utopian, War.	Yes
Sentiment	The attitudes towards the machine vision technology represented in the Creative Work. Sentiments are tagged with one or more of the following words: Alien, Creepy, Dangerous, Disgusting, Empowering, Exciting, Flawed, Fun, Helpful, Hostile, Intimate, Intrusive, Misleading, Neutral, Oppressive, Overwhelming, Prosocial, Protective, Subversive, Wondrous.	Yes
Situation	The titles of Machine Vision Situations in this Creative Work. A Situation is a specific scene or event that involves machine vision technologies.	Yes
SituationID	A number that uniquely identifies the situation in the dataset.	Yes
Character	The names of characters in the work who engage with machine vision technologies.	Yes
CharacterID	A number that uniquely identifies the character in the dataset.	Yes

vision technologies are present in a Creative Work, facilitating analysis of how agency is enacted and distributed between human and non-humans in art, games and narratives. The SituationID is included both in *creativeworks.csv* and *situations.csv,* allowing the files to be combined as desired.

The main unit of analysis is the verbs in each situation, which describe how human and non-human agents in a situation interact with the machine vision technologies. The verbs and agents are in the file *situations.csv*. We have also included *situation_descriptions.csv*, which gives the written descriptions of each situation as entered in the database by the research team, and which also includes short verbal quotes from the text of the work, if relevant. Finally, *situation_visuals.csv* includes free tagged descriptions of the colours and aesthetic qualities that characterise each situation, and a Boolean field indicating whether or not the situation is presented from the point of view of a machine, as when seen "from a drone's perspective" for instance. The colours and aesthetic qualities are not as systematically gathered as the other data in the dataset.

The main file, *situations.csv* includes three data types about each of the 874 identified situations: content description, agents in the situation, and the action taking place. Description

Table 6
Fields in the file situations.csv.

Column header	Description	Multiple values possible
SituationID	A number that uniquely identifies the situation in the dataset.	No
Situation	The situation title includes the title of the work the situation is in followed by a parenthesis with few words describing the situation.	No
Genre	The genre that the Situation belongs to, either Art, Narrative or Game.	No
Character	The name of the character. Characters are agents (i.e. they engage in some kind of activity with the machine vision technology) with at least one identifying trait, e.g. they are *adult humans*, or *bisexual, adult cyborgs*. Additional data about each Character (Species, Age, Ethnicity, Gender, and Sexuality) can be found in *characters.csv*.	Yes
CharacterID	A number that uniquely identifies the character in the dataset.	Yes
Entity	A generic agent where details about species, age, ethnicity, gender, sexuality or such details are not relevant or available to us. This field uses a fixed vocabulary: Corporation, Creator, Environment, Government, Humans in general, Image, Law enforcement, Military, Object, User.	Yes
Technology	Machine vision technologies as defined in Table 2.	Yes
Verb	Actions taken by Characters, Entities or Technologies in the Situation. Verbs are an open vocabulary only limited by their form: they either end in *-ing* to indicate a more active stance or end in *-ed* to indicate a more passive or receptive stance. Verbs were assigned with the requirement that they fit in the sentence "This character/entity/technology is ___ing" or "This character/entity/technology is ___ed." Like the other data, these are qualitative interpretations or descriptions of actions in the Situation and are not automatically extracted from the works.	Yes

data includes the title of the Situation and genre of the Work it is in. We differentiate between three types of agents: characters, entities and technologies. Data depicting agential action in the situation is characterized by verbs, formulated to allow for and distinguish between active and passive actions. Table 6 gives full descriptions of each column in situations.csv.

1.4. Characters

The *characters.csv* file lists the 778 Characters that interact with machine vision technologies in the Creative Works. The variables for each character are species, gender, race or ethnicity, age, and sexuality (see Table 7). The ethical considerations taken when making statements about nuanced and sensitive identity traits like race, gender and sexuality, even for fictional characters, are discussed in the Ethics Statement at the end of this paper.

90 of the characters are "group" characters, such as the Gamemasters in *The Hunger Games*. These characters have the value "TRUE" in the column IsGroup. For group characters we have assigned values to shared traits and marked other traits as Unknown. For example, in *The Hunger Games*, the Gamemasters are all adult and human, but they include both men and women, and while the three most prominent are White, Lucia, who has a minor role in the first movie, is Black. Rather than allow multiple values for a trait we have opted to leave the trait as "Unknown" in cases like this. The Gamemasters' sexual preferences are not all made explicit, so Sexuality is also marked as "Unknown". Unknown is thus a term that can include cases where a trait is not made explicit in the work as well as cases where the trait is not applicable to the character or group of characters.

There is one row for each character, unlike *creativeworks.csv* and *situations.csv* where there are multiple rows for each Work or Situation since we allowed multiple values in the same field. There are a few characters where we could have allowed multiple values. The most obvious would be for three characters who are explicitly represented as identifying as transgender women: the robot Paladin in Annalee Newitz's novel *Autonomous* (2017), Max Lao in the game

Table 7
Fields in characters.csv.

Column header	Description of contents
CharacterID	A number that uniquely identifies this item in the dataset.
Character	The name or title of a Character. If the name can be mistaken for another character in the dataset, it is followed by the title of the Creative Work in which the character appears, in parentheses. Quotation marks are used to indicate personas, or representations of real people. For an explanation of personas see the Ethics Statement below.
Species	Animal, Cyborg, Fictional Species, Human, Machine, Unknown.
Gender	Female, Male, Non-binary or Other, Trans Woman, Unknown.
RaceOrEthnicity	Asian, Black, White, Person of colour, Immigrant, Indigenous, Complex, Unknown.
Age	Child, Young adult, Adult, Elderly, Unknown.
Sexuality	Homosexual, Heterosexual, Bi-sexual, Other, Unknown.
IsGroup	A Boolean true/false variable, where TRUE means that the entry describes a groups of several people acting together.
IsCustomizable	A Boolean true/false variable, where TRUE means that the character can be customized by the user. All customizable characters in the dataset are player-characters in video games.

Technobabylon (2015), and "Chelsea Manning" as represented in Heather Dewey-Hagborg's artwork *Probably Chelsea* (2017). We could have tagged them as both transgender and as women, but instead chose to use the single category "transgender woman". There are no explicitly transgender male characters interacting with machine vision technologies in the 500 works we have analysed. There are also cases like the machine animals in *Horizon Zero Dawn* (2017), which could have been given both values for Species: machine and animal. We decided to avoid multiples and choose the most salient trait, so, although we regret the reductionism, the machine animals are simply machines in the dataset.

1.5. Interoperablity

The dataset includes Wikidata IDs for each creative work and each creator (artist, author, producer etc.) when available. Wikidata IDs combine the letter Q with a unique numeric data. For instance the game *Horizon Zero Dawn* has the Wikidata ID Q20155528. More data about any item that has a Wikidata ID can be found at a URL ending in the ID, so data linked to *Horizon Zero Dawn* is available at https://www.wikidata.org/wiki/Q20155528.

Wikidata IDs for works are in the file *worksinfo.csv* while IDs for creators are in *creators.csv*. The Wikidata IDs can be used to connect the dataset to other data. Many works, like *Horizon Zero Dawn,* have a lot of data linked through Wikidata, including names of contributors, its budget, the awards it has been nominated for and much more, and its Wikidata page also links to the work's unique ID in other datasets, like on IMDb, Metacritic or even on fandom wikis. Data can be automatically fetched from Wikidata, for instance using the WikidataR package for R or a SPQRL query. The Wikidata ID makes it easier to connect this dataset to other existing or future research datasets about the same works, so long as they include Wikidata IDs.

Unfortunately Wikidata covers mainstream movies and video games well, but contemporary digital art is almost invisible in Wikidata. We could not find other robust ontologies or data sources for digital art, either. Databases of art tend to be connected to individual museums, or in some cases, to national or regional collaborations between museums. For instance, the National Portrait Gallery in the UK and the National Gallery of Canada have databases with information and unique identifiers for artworks in their collections, while Europeana, Calisphere and Digitalt museum, for example, have digitised images from European, Californian and Norwegian archives, art museums and other collections, respectively. There are subject-specific databases, like the Art and Surveillance database (http://www.artandsurveillance.com) or the Rhizome Artbase for born-digital artworks (https://artbase.rhizome.org/wiki), but they do not display unique identi-

fiers that allow for connection to other databases. This means that art that is not in a museum collection or in an auction house database can rarely be connected to any existing datasets. This is the case for most of the artworks in the Machine Vision in Art, Games and Narratives dataset as they are digital and have only been shown online or at festivals and exhibitions.

Most of the games and movies in our dataset have Wikidata IDs, because they are registered on IMDb, which feeds into Wikidata. However, indie games and movies are often not included. Although novels have ISBN numbers and are well-documented in library catalogues, a lot of the novels in our dataset were not in Wikidata, and this was especially the case for novels not published in North America or the UK. Short stories almost never have Wikidata IDs. We chose not to include ISBNs since they would only work for novels, and not for short stories or other kinds of narrative.

2. Experimental Design, Materials and Methods

2.1. Selection Process

Data was collected between January 2019 and October 2021. The main selection criteria were: that one or more of the 26 identified machine vision technologies (Table 2) was used or represented in the work; that the work could be categorized as a video game, an artwork, or a narrative; and that machine vision was thematized in the work. We interpreted narrative broadly to include novels, movies, electronic literature etc.

Creative Works were selected by using a strategic sampling technique aimed at documenting a wide array of both popular and outlier examples, so as to capture both mainstream representations of machine vision and more experimental approaches.

The selection method combined expert knowledge of the relevant fields of cultural production with systematic searches of existing databases guided by a grounded theory framework of "saturation." The core team (Rettberg, Kronman, Solberg and Gunderson) have graduate degrees in comparative literature, media art history, gender studies, English literature, digital culture, and have published research on video games, digital art, fan fiction, electronic literature, and narratology. Kronman is also a practicing digital artist with over a decade's experience in the field of digital art. To consolidate our sampling, we searched the databases listed in Table 8 using the names of technologies as keywords. We also used algorithmic recommendations on platforms like Steam and Goodreads, which suggest games and novels similar to ones already viewed, and used Instagram and Twitter to find artists and other works. The data collection team received training in social science classification methods of iteration, coding and intercoder reliability.

In addition, we considered works nominated or shortlisted for awards and competitions or exhibited at relevant festivals, exhibitions and conferences, which were attended by team members both physically and digitally. A snowball sampling method was employed to find more works by directors, authors and artists we had identified as engaging with machine vision technologies in their works. Saturation was reached quickly for some kinds of technology (e.g., neural networks for image generation), prompting us to stop collecting more examples and move on to other technologies or genres.

Our selection did not aim at data completeness or universality. Given the human-level method of classification, the interpretive qualitative guiding framework, and the vast number of works that reference machine vision, we aimed to instead capture a broad range of examples that could provide material to understand different ways in which machine vision is represented and used in art, narrative and games.

There are artists, particularly those working with artificial neural networks like Mario Klingemann or Memo Akten, whose whole body of work uses machine vision technologies. To include works by a broader scope of artists we decided on a limit of three works per artist. When choosing representative artworks from an artist's or artist collective's body of work, widely exhibited

Table 8
Databases used to find examples of games, digital art and narrative where machine vision technologies are central.

Database	Genre	Information used
Rhizome	Digital Art	Keywords in titles
Archive of Digital Art	Digital Art	Keywords, category search
Ars Electronica Archive	Digital Art	Prix Ars Electronica winners
AI Art Gallery	Digital Art (using machine learning)	Searched collection for works by groups underrepresented in media art and AI
Computer Vision Art Gallery	Digital Art (focus on computer vision)	Searched collection for works by groups underrepresented in media art and AI
Art and Surveillance database	Surveillance art	Searched collection for works by groups underrepresented in media art and AI
Worldcat	Narrative (Novels, short stories)	Titles, book blurbs
Google Books	Narrative (Novels, short stories)	Full text search
Steam	Games	Tags, suggestions
IMDB	Narrative (Movies, TV shows)	Titles, summaries
Archive of Our Own	Narrative (Fan fiction)	Tags, keyword search
Creepypasta Wiki	Narrative (Creepypasta)	Tags, full text search
ELMCIP	Narrative (Electronic literature)	Tags, platforms, descriptions
Goodreads	Narrative (Novels, short stories)	Titles, quotes, similar literature
Dictionary of Surveillance Terms in Science Fiction	Narrative (Science fiction novels and movies)	Surveillance terms

artworks that had been experienced or seen by database authors at exhibitions (also online) were prioritized.

When it comes to fan fiction, searching for stories that featured machine vision in meaningful ways turned out to be more challenging than expected. Even when selecting for fiction based on works that include MV technologies, the available search tools were inapplicable for the task of identifying relevant stories, as the presence of machine vision technologies is not commonly flagged in titles, tags, or blurbs. As a result, the genre is not widely represented in the database.

A considerable effort was made to ensure diversity in our sample of works and creators; however, the dataset is skewed towards English language and Euro-American cultural contexts, as shown in Fig. 2 above. In the case of artworks Dr. phil. Graziele Lautenschlaeger, a Brazilian media artist, curator and researcher in media history and theory was employed. She identified and partly translated 20 works from Latin America to be added into the database. Diana Arce, an Alaskan-born Dominican artist, researcher, and activist based in Berlin, Germany, was consulted to bring forth underrepresented groups in the media arts. We prioritized inclusion of works reflecting perspectives of BIPOC and LGTBQ+ communities, but chose not to collect sensitive personal information about creators' gender or sexuality. To increase the diversity of narratives, we hired a group of ten students to search for relevant movies and novels-. The group consisted of advanced undergraduate and MA level students in English literature, French literature, Digital Culture and Nordic literature at the University of Bergen; several also had undergraduate training in Media studies and Film studies. Half of the students were immigrants to Norway, providing further cultural and linguistic diversity. They additionally searched for movies, short stories and novels from outside of North America and Western Europe, for example using online lists of sci-fi from specific areas or cultures as well as anthologies and articles about global sci-fi. We provided initial training and group-based and individual follow-ups as the students worked, and the core team doublechecked each of their entries.

A country-by-country breakdown shows the UK dominating the European data (see Fig. 3), largely because of the dominance of English language narratives. The distribution of artworks is less Anglo-centric than that of narratives. Since artists and other creators are internationally mobile, the country or countries assigned to an artwork can include the creator's country of origin, their country of residence, and the country where the work was produced. This may

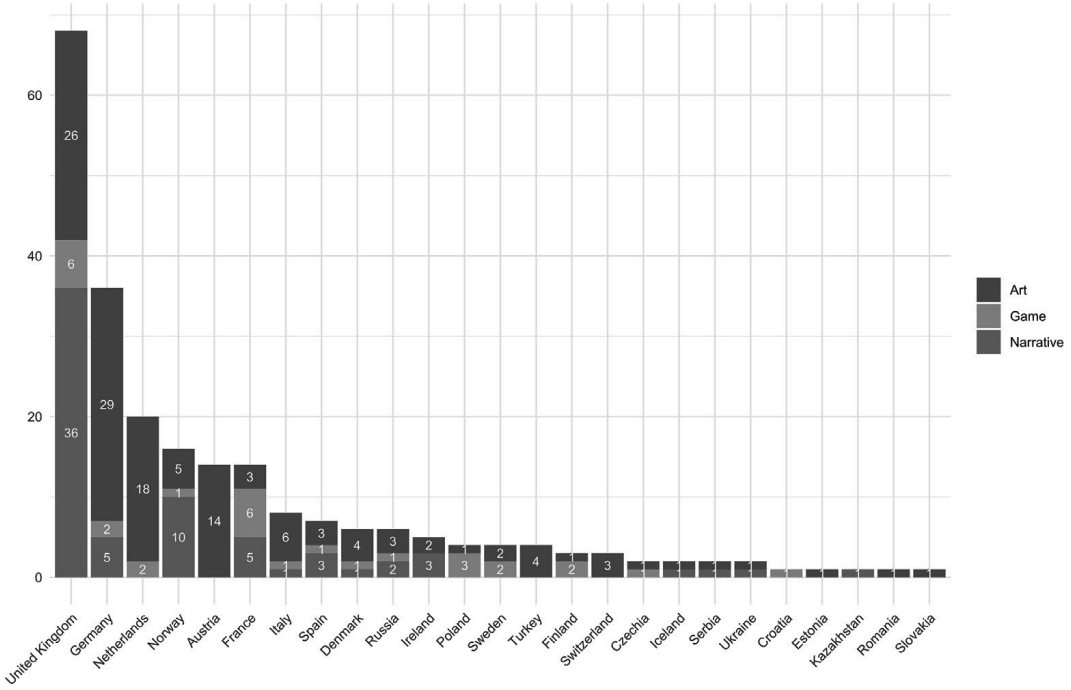

Fig. 3. European and Central Asian works in the dataset. Note that some works are affiliated with several countries.

mean that the overrepresentation of the United States, the United Kingdom and Germany is caused partly by the fact that many artists and production companies are located in the US, UK and Berlin, although the people creating the art, games or narratives may be from other parts of the world.

2.2. Developing the Method

The data was entered into a relational database built in Drupal (http://machine-vision.no). The database architecture is an adaptation of the ELMCIP Electronic Literature Knowledge Base [4]. The dataset documented in this paper was exported from the database and includes most of the data fields.

The data structure was developed iteratively by discussing and interpreting a small initial selection of Creative Works where machine vision technologies were particularly salient. The final organization of the database is shown in Fig. 4. Fields that are included in this dataset have been given coloured backgrounds.

Most fields in the dataset contain interpretative rather than objective data. Standard metadata like the Year of publication and the Title of the Creative Work were usually easy to find but assigning a Topic or a Sentiment required an act of interpretation. Including data that is known to be interpretative rather than assumed to be an objective ground truth is typical of digital humanities projects [5]. We worked to ensure consistency by developing the data structure iteratively as a team and tagging many works together as a group. This collaborative, open-ended classification and annotation process occurred early in the project. Once we reached a point of intercoder reliability in group analysis of qualitatively generated data, where we agreed on most of the tagging, we worked individually.A more detailed explanation of the classification and annotation process vouches for the robustness of our final dataset: Following multiple, collaborative analysis sessions amongst the research team, which involved open-ended, qualitative

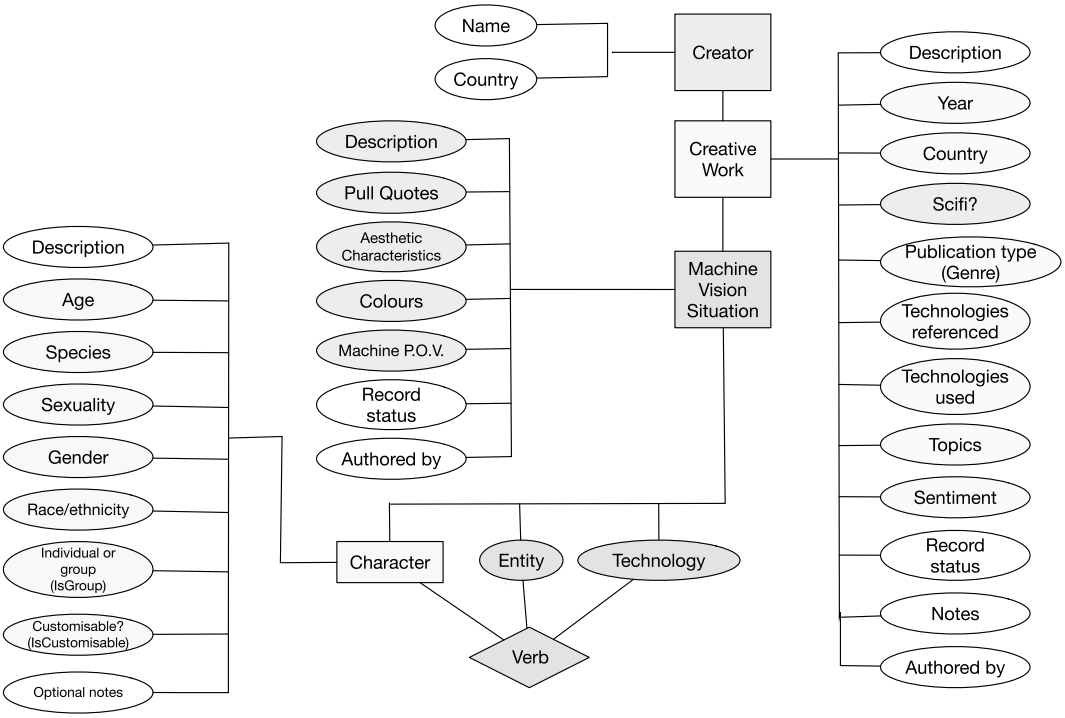

Fig. 4. A diagram of all fields in the database showing the relationships between them. Fields included in this dataset are shown with a coloured background. Rectangular boxes indicate content types and oval boxes are variables with a fixed vocabulary.

and thematic analysis of the content, we established a fixed vocabulary to create data labels for the Topics and Sentiments associated with each Creative Work. This analysis was necessarily iterative and adjustable as new Works were annotated, since the team found that early labels did not always fully capture key aspects of the new Works. This common practice in grounded theory coding requires continual assessment, expansion and/or adjustment as new Works are analysed.

When individuals noted low confidence in their own or others' annotations, intercoder reliability was reassessed: The group would convene to repeat the collaborative and open-ended classification and annotation process noted above, until intercoder realiability was again reached.

We developed the concept of a Machine Vision Situation to capture granular details of what humans, technologies, and other agents are doing in specific interactions with machine vision technologies. We wanted to avoid falling into common binary assumptions [6] about how humans either use technologies as simple tools and remain fully in control (techno-optimism) or how technologies determine culture and leave humans little autonomy (technological determinsm). Our first attempts fell into these traps. For example, we tried a model in which we tagged characteristics and sentiments of the 'operators' of machine vision technologies as well as the people 'watched' through machine vision. An early methodology paper from the project [7] describes this, but also notes how we were experimenting with a more open coding to avoid the binary assumption that a person always operates machine vision as a tool to watch another person. These experiments led to our current data structure. Two of the core team members, Ragnhild Solberg and Marianne Gunderson, came up with the alternative model of assigning an active or passive verb to Characters, Technologies and Entities in a Machine Vision Situation, and we developed and fine-tuned this model as a team.

The resulting classification and annotation process described in this section provides data that is less anthropocentric and deterministic than our first attempts. Rather than always assum-

ing that human actors are the most important or that technologies determine use, our model allows us to see how agency is distributed between multiple agents. The verbs assigned to Characters, Entities and Technologies in a Situation describe different kinds of agency. This enables analyses that explore the *assemblage* of different agents in a situation, for example in a posthumanist or feminist new materialist framework [8–10], or using situated data analysis [11].

Ethics Statement

The data was not scraped from websites or existing databases, and consists of standard bibliographic metadata and original, qualitative and interpretative analysis data. The dataset does not contain personal data apart from the names of artists, authors and other creators of published or publicly available creative works, and there is no need to anonymise it.

Race, gender and sexuality of fictional characters

The variables for gender, sexuality, and race/ethnicity are used to describe how characters are represented in the work. Bias is a frequently cited problem in machine vision technology [12–14], and to be able to analyse bias in how machine vision is represented in art, games and narratives it was necessary to collect data about gender, sexuality and race/ethnicity. We approach these labels as socially constructed categories and acknowledge that they may have overlapping and contradictory content and meanings in different contexts. This is especially reflected in the race or ethnicity field, where we have chosen to include multiple labels that reflect different ways in which characters may be seen as racialized or ethnically "other". Other datasets documenting the gender or race of characters in movies or video games tend to use standard demographic categories from a specific country [15]. This is not possible when collecting data globally as we have done, because race and ethnicity are read differently in different cultural contexts.

Many of the works lack explicit information about characters' gender, sexuality, or race, so we have relied on discursive and cultural markers to induce the character's characteristics when possible and used the tag "Unknown" when this information is ambiguous or missing.

Personas: Representations of real people

Some of the Characters we have registered are representations of real people, such as when a performer appears in a music video. In these cases, the data collected describe the persona the person is portraying in this particular work, and do not necessarily correspond to the actual person's characteristics.

Ethical assessment of using data about creators

The Norwegian Centre for Research Data (NSD) found that this dataset is in compliance with the GDPR (reference code 833684). The project processes general categories of personal data, but only minimally (names of creators, countries creators live in or are affiliated with). The project processes personal data on the legal basis that processing is necessary for the performance of a task carried out in the public interest, cf. the General Data Protection Regulation art. 6 nr. 1 e), cf. art. 6 nr. 3 b), cf. the Personal Data Act § 8. The assessment of NSD is that the processing meets the requirement of scientific research, cf. the Personal Data Act § 8, and therefore constitutes a task in the public interest.

For each Creative Work, we register the creator name and their country of origin/residency, but we have not collected any additional information about the creators of the works.

Some of the creative works are informally published and their authors may not have the same expectation of publicity as when a work is formally published or exhibited. In these cases, the Creator field only documents the name that the creator has published under, which is commonly a pseudonym. For these entries, information about country of origin is not included, as this is usually not known. All data collected from openly published original fiction published on online platforms is in compliance with each of the platforms' redistribution policies.

Declaration of Competing Interest

Linda Kronman is a member of the artist collective KairUs, which has three works of art included in the dataset. The authors declare that they have no other known competing financial interests or personal relationships which have or could be perceived to have influenced the work reported in this article.

Data Availability

A Dataset Documenting Representations of Machine Vision Technologies in Artworks, Games and Narratives (Original data) (Dataverse).

CRediT Author Statement

Jill Walker Rettberg: Conceptualization, Methodology, Investigation, Data curation, Writing – original draft, Writing – review & editing, Visualization, Supervision, Project administration, Funding acquisition; **Linda Kronman:** Methodology, Investigation, Data curation, Writing – original draft, Writing – review & editing; **Ragnhild Solberg:** Methodology, Investigation, Data curation, Writing – original draft, Writing – review & editing; **Marianne Gunderson:** Methodology, Investigation, Data curation, Writing – original draft, Writing – review & editing; **Stein Magne Bjørklund:** Software, Data curation; **Linn Heidi Stokkedal:** Methodology, Investigation, Data curation, Project administration; **Kurdin Jacob:** Investigation, Data curation, Project administration; **Gabriele de Seta:** Formal analysis, Writing – review & editing, Project administration; **Annette Markham:** Methodology, Writing – review & editing.

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References

[1] Rettberg, Jill Walker; Kronman, Linda; Solberg, Ragnhild; Gunderson, Marianne; Bjørklund, Stein Magne; Stokkedal, Linn Heidi; de Seta, Gabriele; Jacob, Kurdin; Markham, Annette, 2022, "A Dataset Documenting Representations of Machine Vision Technologies in Artworks, Games and Narratives", doi:10.18710/2G0XKN, DataverseNO, V1

[2] J.W. Rettberg, L. Kronman, R. Solberg, M. Gunderson, S.M. Bjørklund, L.H. Stokkedal, L. Heidi, G. de Seta, K. Jacob, A. Markham, Database of machine vision in art, games and narratives: archival version in HTML and CSS, (2022). URL: https://machinevisionuib.github.io doi:10.5281/ZENODO.6514729.

[3] J.W. Rettberg, Scripts for analysing data from "a dataset documenting representations of machine vision technologies in artworks, games and narratives," 2022. doi:10.5281/zenodo.6510181.

[4] S. Rettberg, Documenting a field: the life and afterlife of the ELMCIP collaborative research project and electronic literature knowledge base, Electron. Book Rev. (2021), doi:10.7273/kfmq-7b83.

[5] L. Gitelman (ed.), Raw Data is an Oxymoron, "Raw Data" is an Oxymoron, MIT Press, Cambridge MA, 2013.

[6] D.J. Haraway, A cyborg manifesto: science, technology, and socialist-feminism in the late twentieth century, in: Simians, Cyborgs and Women: The Reinvention of Nature, Routledge, New York,, 1991, pp. 149–181.

[7] J.W. Rettberg, M. Gunderson, L. Kronman, R. Solberg, L.H. Stokkedal, Mapping Cultural Representations of Machine Vision: developing Methods to Analyse Games, Art and Narratives, in: Proceedings of the 30th ACM Conference on Hypertext and Social Media, New York, NY, USA, ACM, 2019, pp. 97–101, doi:10.1145/3342220.3343647.

[8] J. Bennett, Vibrant Matter: A Political Economy of Things, Vibrant Matter: A Political Economy of Things, Duke UP, Durham and London, 2010.
[9] N.K. Hayles, Unthought: The Power of the Cognitive Nonconscious, Unthought: The Power of the Cognitive Nonconscious, University of Chicago Press, Chicago, 2017.
[10] R. Solberg, (Always) playing the camera: cyborg vision and embodied surveillance in digital games, Surveill. Soc. (2022) In press.
[11] J.W. Rettberg, Situated data analysis: a new method for analysing encoded power relationships in social media platforms and apps, Humanit. Soc. Sci. Commun. 7 (2020) 5, doi:10.1057/s41599-020-0495-3.
[12] J. Buolamwini, T. Gebru, Gender shades: intersectional accuracy disparities in commercial gender classification, in: Proceedings of the Conference on Fairness, Accountability and Transparency, 2018, pp. 77–91. http://proceedings.mlr.press/v81/buolamwini18a.html.
[13] R. Benjamin, Race After Technology: Abolitionist Tools For the New Jim Code, Race After Technology: Abolitionist Tools For the New Jim Code, Polity, Cambridge, UK, 2019.
[14] W.H.K. Chun, Discriminating Data: Correlation, Neighborhoods, and the New Politics of Recognition, MIT Press, Cambridge, MA, 2022.
[15] D. Williams, N. Martins, M. Consalvo, J.D. Ivory, The virtual census: representations of gender, race and age in video games, New Media Soc. 11 (2009) 815–834, doi:10.1177/1461444809105354.

Article II

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Holograms in the borderlands: Non-human presence and agency in games

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Abstract. Holograms are common background features conveying a science fiction mood. Digital games allow us to experience worlds where holograms are positioned as agents with functions beyond being atmospheric objects. This article tracks a broad cultural understanding of the hologram and identifies holographic representations in 24 digital games. This is followed by a close reading of holograms in the video game *Horizon Zero Dawn* (Guerrilla Games, 2017). These holograms provide access to forgotten knowledge and place players and player characters in actively observing positions while the past is replayed in navigable cutscenes. I argue that the holograms' aesthetic, narrative, and mechanical functions challenge binary conceptualizations of presence and agency. This happens diegetically in the virtual environment but is also mirrored between player and game. Digital game holograms mediate thematically and formally between human and non-human agents, which helps us see how machines and humans are connected through agency in complex posthuman assemblages.

Keywords. hologram, cutscene, distributed agency, *Horizon Zero Dawn*, posthumanism

Introduction

The young hunter Aloy is alone in an ancient subterranean building when she finds a mysterious device. After some exploration, the device detects a lifeless body on the ground, and suddenly a partially transparent purple man stands in front of her. He looks straight through her and talks as if to an adult before interrupting himself by enthusiastically congratulating his son on his birthday. Aloy, orphaned and outcast and with a clear emotional connection to the situation, says "Show me… Show me again!" and causes the device to play the man's speech and actions again. This time she smiles at the man and tries answering him. Still, he gives no sign of hearing or seeing her, but keeps his gaze fixed on a point behind her the whole time. When she turns to check, there's nobody there. Aloy, the protagonist and character played in the action role-playing game *Horizon Zero Dawn* (Guerrilla

Games, 2017), has just seen her first hologram, unaware that it is by far the only one - not in her world nor in virtual environments in general.

Figure 1 Screenshot from *Horizon Zero Dawn* (Guerilla Games, 2017).

Aloy and the player experience early on that holograms are contradictory elements in the virtual environment. To the player, the hologram is clearly a recording of the unknown man while he was still alive: Aloy can rewind what he does and see through his body, and he does not recognize her presence even if she tries to communicate with him. But the player experiences the virtual environment through Aloy, and for her the hologram is not just a recording. She seeks his attention because the unknown man appears to be a human being from his speech and actions. The presentation is helped by the fact that in three-dimensional form he occupies the same graphic area as Aloy, in contrast to how a screen-based medium or a diary could present him in the virtual environment. The hologram has characteristics defined like other game objects, presented visually as near-human and narratively as a representation of a deceased man. He is present in the virtual environment, but at the same time not completely present.

This article examines the functions of holograms in digital games (hereinafter: games). First, a broad cultural understanding of the concept of holograms is introduced to demonstrate how they have established themselves as complex and to some extent contradictory figures in popular culture in general (Johnston, 2016; Jones, 2019; Parrent, 2017). A closer look at how holograms can be "between existences" (Janik, 2019) in games shows how holograms support this view visually and narratively as well as through game mechanics. I then identify holographic representations in 24 games, grouped according to their roles in the virtual environment: futuristic embellishment, navigation tool, communication tool, embodiment of AI, memory, and clone. The intention is not that the overview represents a typology, but that it establishes an understanding of the scope of and variations in how aesthetic, narrative and mechanical functions present holograms as physically present, but never "quite there". The overview shows that holograms in games are often visual tools

that convey a futuristic mood and, as with Aloy's first encounter with holograms, narrative tools that manage and disseminate information. Such symbolic and representative roles are not media specific. But game holograms can also be accorded ludic functions as part of the game mechanics - the internal codes and processes that make up the functionality of games. One can, for example, navigate the world, deceive enemies, and solve puzzle tasks using game holograms.

The examples from the 24 games show the difference *between* games in what is represented holographically and the function it has in the gaming activity. They also hint at differences *within* games between the visual representation of the holograms and their role as narrative and programmed/ludic elements, what I refer to as the aesthetic, narrative, and mechanical functions of the holograms. I specifically focus on *Horizon Zero Dawn* to illustrate this. In the game, you follow Aloy's rediscovery of her own and the world's prehistory while navigating a post-apocalyptic landscape. This rediscovery is presented in holographic cutscenes with varying degrees of playability. Here, both the player and the player character are put in the position of observer while machines replay the past. My analysis builds on posthumanist conceptualizations of the relationship between humans and machines (Boulter, 2015; Giddings, 2005; Hayles, 1999, 2017; Keogh, 2014; Taylor, 2009). In particular, Hayles' (1999, 2017) concept of "distributed agency" and game research that challenges binary understandings of "agency" (Janik, 2019; Keogh, 2014; Klevjer, 2002) provide a conceptual framework for exploring the tensions that arise when holograms position themselves at the intersection of presence and agency.

In the article I argue that holograms challenge conceptualizations of traditionally binary opposites (human and non-human, present and absent, acting and passive). Instead, the holograms allow us to see what is in between - in the borderlands. *Horizon Zero Dawn* exemplifies how holograms can share agency with both the player character and the player. In this way, game holograms are both thematically and formally angled towards mediation between man and machine, within virtual environments as well as outside. The aesthetic, narrative, and mechanical functions of holograms become part of the discourse about the role of technology in society and our (lack of?) control towards non-human agents. Finally, I show how the presence of holograms in the virtual environment tells us that the game medium itself is a complex assemblage of human and non-human agents within, between, and outside virtual environments.

Hologram: a cultural understanding

Before I take a closer look at how holograms are represented in games, it is necessary to clarify what is meant by the term "hologram". In short, a hologram stores light that is reflected by an object. In this way, holograms are similar to ordinary photographs, but stand out because they appear as three-dimensional - an effect that comes from how holograms mimic the way our eyes detect light from several points and merge the light sources into a three-dimensional image captured in glass or metal (see e.g. Richardson & Wiltshire, 2018, 2, 16). Holograms are common and can be found in bank and identification cards as protection against forgery. However, this is not the type of hologram that is most often presented in popular culture.

Johnston (2016, 202) explains how other technologies are often incorrectly identified as holograms because the term is wide-ranging. Holograms have had parallel developments in various fields, such as optical illusions in theater, as a driving force in modern art, as engineering work related

to optics, as holders of information in security and politics and - most relevant to this article - as visions of the future in literature and film. Some of the parallels are highlighted in how news media use the "hologram" label for software singer Hatsune Miku[1], in illusions such as Tupac's appearance at Coachella[2] and Robert Kardashian's greeting to his daughter Kim Kardashian[3], as well as in the gaming industry with SEGA's arcade game *Time Traveler*[4] (Virtual Image Productions, 1991). Technology news forums are constantly reporting that now, *finally*, holograms are here, even though this type of hologram technology is not yet in place. Nevertheless, the fascination with the technology’s potential is clearly present even though these examples are not formally holograms.

As the examples of Hatsune Miku, Tupac, Kardashian and *Time Traveler* show, there are cultural understandings of what a hologram is. Holograms that move independently of screens or lasers are still reserved for special effects and optical illusions, but such holograms are natural parts of fictional universes. Perhaps the most famous hologram from fictional worlds can be found in *Star Wars: Episode IV – A New Hope* (Lucas, 1977). Here, a three-dimensional figure of Princess Leia is generated using a choppy blue laser projected from a droid. At first, the projection is explained as an error caused by old and corrupt data, but it turns out to be an intentional cry for help that starts the hero's journey. The hologram is seemingly only a trope of technological progress in the film world but acts as the catalyst for the entire *Star Wars* adventure. The Leia hologram shows how holograms can have several functions in a cultural context, particularly under the umbrella term "science fiction". This article is therefore based on Johnston's (2016, 202) conclusion that holograms are cultural constructions with more potency than the scientific product. In a culturally constructed sense, holograms are less technically oriented and more used as visual metaphors, often in the context of speculative futures (Johnston, 2016, 213).

My exploration of game holograms illustrates that they operate with different rules than holograms in our physical world. As Johnston (2016) introduces, and as demonstrated later with my overview of holographic projections in games, game holograms are not formulaic in their functions. Instead, they build on multiple cultural understandings of what they can do. These understandings are most often linked to different ways of overcoming bodily limitations. That said, games give us the opportunity to experience many different worlds where holograms exist and thus we will also encounter many different holograms. The breadth of representations will sometimes make it challenging to assess whether something is a hologram. This may, for example, apply to differences in tactility and substance or diffuse boundaries between hologram technology and similar technologies such as augmented reality (AR) (Elmahal et al., 2020)[5]. The common denominator for game holograms is that they are three-dimensional projections that are clearly presented as holograms in the virtual environment, either by reference (usually with the prefix “holo-”) or design (the pixelated blue-purple effect). When games point out that we are dealing with a hologram, it is most often in embodied form: projections of characters in the same graphic area as the player character. Unlike a screen-based medium, an audio file, or a diary, the boundaries between player characters, non-player characters, and holograms are less clear. The hologram is still different from the rest of the virtual environment, but the boundary between representation and the "reality" of the virtual environment is blurred.

Holograms, ghosts and being "between existences"

What does it mean to be present and absent at the same time? The representation of holograms reflects representations of the ontological borderlands of ghosts. Ghosts, like holograms, often become images of hope and fear associated with the limitations of human bodies. The bodies of humans and animals are manifested in an intermediate existence that to varying degrees resembles its origin. Ghosts are neither here nor there, but in fantasy worlds they can still haunt, scare, calm, tease - in short, they impact. In several cases, holograms become digital ghosts, both in how they look and in how they are treated by others.

Using Derrida's hauntology, Janik (2019) explores how ghostly figures impact our reality. Ghosts, according to Janik, exist in the borderlands between the human world and the "other side" (2019, 1). Janik points out that a ghost is a sign of proximity and at the same time the separation between ontological domains such as living/dead and past/future. The fact that they have one foot on each side means that they can impact across these borders, but also that they are never completely on one side or the either. The parallel with holograms is clear, but instead of the transition between living and dead, it is the transition between organic and digital that is in focus.

Derrida's texts also help Jones (2019) explore characters that are between existences. On the space station Tacoma in the adventure game of the same name (Fullbright, 2017), the crew has disappeared. Instead, the player character encounters a three-dimensional recording of the crew created by artificial intelligence (AI), who Jones refers to as "ghostly bodies", "phantoms", and "apparitions". They are also holograms. The space station's AR system generates these recordings as holograms, and it is the player character's job to find out what has happened to the crew through playing the recordings. Jones argues that the holograms in *Tacoma* show how the movements and bodies of phantoms are present, but at the same time mark their absence by being ghostly. They, like Janik's ghosts, are "between existences".

The existence between the digital and the organic/physical that holograms thematize, becomes actualized in the society around us as we outsource traditional human cognitive processes to machines, and machines and algorithmic thinking gain more influence over our lives (Kronman, 2020; Rettberg, 2019). The dividing lines between human and non-human agents are blurred. To represent their immateriality, holograms rely on conventions such as bluish color, the choppy effect, and transparency. They create an illusion of vitality through similarity to what they represent but are at the same time clearly digital products and are often presented as an almost ethereal medium that can go beyond traditional boundaries of what is possible. The contrasts are clear even before the holograms enter the virtual environments. In playable objects, the already complex holograms take on "new meaning", which entails that holograms are captured "between existences" on a semantic and material level (Janik, 2019).

On the game's terms

Holograms gain additional functions when they are in virtual environments. Jones (2019) shows how the holograms in *Tacoma*'s animation and dialogue establish them as present in the room together with the player character, but the visual presentation of them insists on their absence. Jones further explains that when Tacoma's crew occupies space through both presence and absence, this problematizes both categories (2019, 4-5). In their attempt to understand the complex ontology of *Tacoma*'s digital memories, Jones directs the analysis towards visual measures. At the same time,

Jones acknowledges that the holograms' "ghostly aesthetics" together with game mechanics manipulate and highlight questions about existence in a way not possible in other media.

It is, as Aarseth (1997, 2011) and others have pointed out, a collaboration between mechanics, semiotics and player that creates "gameplay" in games. In other words, potential mechanical functions are programmed into a game, but they must be realized/played by a player[6]. The game activity itself is a cybernetic loop (Giddings, 2005; Giddings & Kennedy, 2008) where the player performs the processes through *reciprocal action* with the game. It is thus odd to isolate actions from a narrative or vice versa when analyzing games (when this article draws attention to the individual levels and their functions, it is to clarify how the game media's holograms complement and challenge representations in other media). Jones, Aarseth, Giddings and Kennedy point to posthumanist conceptualizations of agency, from isolated in favor of one agent to being distributed between agents. According to Hayles (1999, 2017), the need for such a perspective arises when one looks at collaboration between human and non-human agents because technological processes and infrastructures become increasingly complex and more closely connected to humans. This complex and close connection between existences is reminiscent of the representations of ghosts.

I build on Janik’s and Jones' observations by highlighting game mechanics as much as narrative and aesthetic elements. The emphasis on all elements builds on the understanding of the vague boundaries between the presence and agency of different agents. I refer to three levels to explain these differences: the aesthetic, narrative, and mechanical levels. Each level can have several functions. The aesthetic level is about the visual design of the hologram. In Aloy's first encounter with holograms, the aesthetic level shows a purple, semi-transparent, pixelated human body in three dimensions. The narrative level is about the fictional universe the game is set in, such as how the holograms are referred to as exciting and intimate for Aloy, but as foreign, magical, and dangerous in society (only after one understands its purpose, is the holographic technology accepted and admired in society, and then almost as a divine object). Furthermore, the holograms Aloy encounters later in the game provide information about the prehistory of the virtual environment, which also contributes to the holograms' narrative function. At the game mechanics level, the holograms occupy the same three-dimensional graphic space as a player character or other similar elements in the virtual environment. Here it is clear how experiencing a hologram differs from watching a video on a screen or listening to audio clips. Although the hologram most often represents a person or figure, they are not just representations - they are also programmed characters in the virtual environment. Some holograms can even affect other game elements, such as when they shoot and injure others.

Holographic projections in games

The following presentation is based on a data material of 24 game titles' representations of holograms, grouped based on the overall role of the hologram in the virtual environments: futuristic embellishment, navigation tool, communication tool, embodiment of AI, memory, and clone. All identified holograms are based on a broad cultural understanding of what a hologram is. The games were released between 1996 and 2020 and include both popular games and indie games in several genres. The sample is not intended to be exhaustive but is a strategic sample with the aim of identifying different ways in which holograms appear in games (see Rettberg et al., 2019). I have

collected, played, and analyzed all the games and have documented them in the database *Machine Vision in Art, Games and Narratives* (Rettberg et al., 2021).

The overview indicates differences in what is holographically represented in virtual environments and how it is presented. Differences also occur several times within the same game, which becomes clear when some titles are repeated in several groupings. I do not use the table format because I want to highlight the nuances and gray areas between the use of holograms in different games rather than setting up separate categories. Nevertheless, any attempt at such groupings will lose some of the complexity of the representations (which becomes particularly noticeable in an article that focuses on the borderlands instead of categorization). It is therefore important to emphasize that visualizations of holograms can vary in degree, for example in terms of how transparent and tactile they are, how much range they have and their size ratio relative to the rest of the virtual environment. At the same time, the way visualizations are implemented mechanically in virtual environments also varies, from illusion to navigation, manifestation, decoration, construction, collaboration, and communication, to name a few applications. In other words, holograms do not follow a single formula, although they mostly use the same aesthetic trope with blue pixels to show that this is a hologram. Therefore, with this overview, I want to establish an understanding of the scope and trends in hologram representations in games in general before I look more closely at specific examples of how holograms allow for exploring the borderlands at the intersection of aesthetics, narrativity and game mechanics.

Futuristic embellishment

Holographic design elements are so common that they will most likely appear in the majority of futuristic virtual environments. This underscores what Johnston (2016) identifies; that holograms serve as visual cues in science fiction. Any object can be such a decorative holographic element. In the tactical role-playing game *Satellite Reign* (5 Lives Studios, 2015), the embellishment appears as holographic trees in what is otherwise a concrete jungle, in the point-and-click adventure game *The Longest Journey* (Funcom, 1999) an arts student has made a holographic sculpture of a dragon, and the *Deus Ex: Human Revolution* (Eidos Montréal, 2011) management's office is decorated with a holographic globe. Similarly, dilapidated houses in the psychological horror game *>observer_* (Bloober Team, 2017) are given holographic facades to hide the decay in poor areas, and in the action role-playing game *Cyberpunk 2077* (CD Projekt Red, 2020), holographic signs and advertisements are scattered around the metropolis. Furthermore, screens and computers in futuristic environments are often holographic, such as in the role-playing game *Neo Cab* (Chance Agency, 2019).

Figure 2 Screenshot from *Satellite Reign* (5 Lives Studios, 2015).

Navigation tool

Another presentation of game holograms is as a navigation tool, something you find in games where the player has to orientate themselves in large worlds. Such maps of the terrain are seen as an interface for the player character in the survival and action-adventure game *Subnautica* (Unknown Worlds Entertainment, 2016) and in cutscenes in the action game *Death Stranding* (Kojima Productions, 2019). In the latter, technical drawings can also produce holograms. The production results in constructions that make the post-apocalyptic landscape easier to navigate for the player character or, in the more ornate direction, as holographic characters whose function is to wave as you pass by.

Figure 3 Screenshot from *Death Stranding* (Kojima Productions, 2019).

Communication tool

Holographically represented bodies are used primarily for communication. Communication is often visualized in the form of video conversations with one or more holographic parties. Holographic video conversations can be found, for example, in the adventure game *State of Mind* (Daedalic Entertainment, 2018), the strategy game *StarCraft II: Wings of Liberty* (Blizzard Entertainment, 2010), the action-adventure game *Watch Dogs: Legion* (Ubisoft Toronto, 2020) and in the action role-playing game *NieR: Automata* (PlatinumGames, 2017), in addition to the previously mentioned *Death Stranding* and *Horizon Zero Dawn.* Generally, only one part of the video call is presented holographically. This is made clear in the action role-playing game *Final Fantasy VII Remake* (Square Enix, 2020). In contrast to the original game from 1997 (of which the 2020 version is a remake), the antagonists in *Final Fantasy VII Remake* are presented in holographic form - and in an almost ridiculously large format in relation to the player character. In the original game, these men physically arrive at the same location as the protagonists, making them more vulnerable to possible counter-attacks. In the new release, powerful men sit safely in their offices while the holograms do the hard work for them.

Figure 4 Screenshot from *Final Fantasy VII Remake* (Square Enix, 2020).

Embodiment of AI

AI communication is distinguished as a separate group because it is a very common way of presenting holograms and because these holograms are most often presented as dynamic characters with their own motivations and opportunities for learning and action. Holograms can be physical representations of AI, usually visualized as a human or a human face. The hologram becomes an embodied avatar through which the AI can communicate and navigate the world, as a kind of communicative interface. A well-known game example is the character Cortana from the first-person shooter *Halo: Combat Evolved* (Bungie, 2001), who appears to the player character with the same aesthetics as the previously mentioned hologram of Princess Leia - with the difference that Cortana does not have a similar physical body other than the holographical representation. The action role-playing game *Mass*

Effect: Andromeda (Bioware, 2017), the action-adventure game *Assassin's creed IV: Black Flag* (Ubisoft Montréal, 2013), and the aforementioned *StarCraft II: Wings of Liberty* and *NieR: Automata* follow the same pattern of embodying AI in holographic form.

An example from *Cyberpunk 2077* illustrates how holographic AI is about gray areas in the transition between digital and organic bodies: The player character V has a chip in their brain with the personality of the late Johnny Silverhand, which is working to let Silverhand take over V's body. Silverhand is presented to V in holographic form, almost like a digital hallucination, which becomes clearer when one understands that only V can see Silverhand. Without the choppy blue light hitting Silverhand from above, players would not see the difference between Silverhand and the rest of the people in the city, which could make both understanding the story and the game mechanics difficult for the player. It is beyond the scope of this article to conclude with the ontological status of Silverhand, but it is a clear struggle for embodiment based on digital files - a place between human and machine.

Figure 5 Screenshot from *Cyberpunk 2077* (CD Projekt Red, 2020).

Memory

Communication also crosses temporality. Holograms as memory are a one-way form of communication; past actions and dialogues in film format. Visual images are important mediators of memory, and in holographic form the actions are situated three-dimensionally in the present. Many of these holograms realize conversations and events that have been filmed and "discovered", almost in an archaeological sense. Young Aloy's first encounter with holograms in *Horizon Zero Dawn* is one such case. Player characters who encounter memory holograms usually have access to technology reminiscent of virtual reality (VR) - for example in *Assassin's Creed IV: Black Flag* and *Death Stranding* – or AR, as for Aloy as well as in *Watch Dogs: Legion*, the adventure game *Tacoma* (Fullbright, 2017), and the action-adventure game *Remember Me* (Dontnod Entertainment, 2013). In the latter, everyone's memories are digitalized and shared in a common cloud using the memory technology "Sensen", and the player character must take the fight against the monopoly of power by

following holographic representations of people's memories. The digitalized memories are explained in the virtual environment as projections in the present through AR, made possible by the Sensen implant that everyone has in their neck.

Figure 4 Screenshot from *Remember Me* (Dontnod Entertainment, 2013).

Clone

In addition to this comprehensive list, several games introduce holographic copies of player characters' (physical) bodies. Such holograms are often used as additional assistance in combat. They act as decoys or optical illusions to confuse the enemy about where you are and are found in titles such as the first-person shooters *Duke Nukem 3D* (3D Realms, 1996), *Tom Clancy's Rainbow Six Siege* (Ubisoft Montreal, 2015) and *Borderlands 3* (Gearbox Software, 2019) as well as the puzzle game *The Talos Principle* (Croteam, 2014) and the MOBA ("multiplayer online battle arena") *Heroes of the Storm* (Blizzard Entertainment, 2015). The degree of tactility and influence these holograms have in virtual environments varies, but they are often presented on an almost equal footing with the agents who have copied themselves, and in some cases they appear as extra players you collaborate with.

In *Heroes of the Storm,* one finds a complex relationship between human and non-human agents, both diegetically and between game and player. The player character Nova Terra is a "stealth assassin" who secretly operates to surprise and kill her enemies in the allies' attempt to destroy the enemy's base before their own is destroyed. One of Nova's skills, "holo decoy", creates a holographic copy of Nova. Nova can remain unseen when she places the hologram near herself so that enemies think the hologram is actually her. She can withstand little damage, so if the enemies attack the hologram instead of her, she can buy precious seconds to kill the enemies before they can easily kill her. However, Nova does not control the hologram when it is placed in the virtual environment. For example, it will run around the area where it was first placed while firing on the enemy team. To convince enemies that the hologram *is* Nova, the player must mimic the hologram's distinct AI so that it becomes difficult to distinguish between the two. In other words, the success of the hologram is

measured by the degree to which it manages to deceive the senses into believing that it is real as opposed to artificial (Parrent, 2017), while the player's success is measured by the degree to which they can imitate the artificial. In battle, the hologram can convincingly mimic the player character, but this requires that the player character also mimics the hologram to some extent.

Figure 5 Screenshot from *Heroes of the Storm* (Blizzard Entertainment, 2015).

Complex media in media

In summary, the holograms are diegetically acknowledged media in media. They stand out from what we usually see around us: The solid bluish color that the screenshots show contrasts with the more natural colors of human and non-human agents in virtual environments. In this way it can be said that the design of holograms in clear color and in choppy/"glitchy" quality is an aesthetic convention that helps us understand them *as a medium* - even in fantasy worlds where it can be difficult to figure out what is what. Consequently, a game hologram becomes a kind of interface, which based on Jørgensen's (2013) terminology is considered both *integrated* and *fictional.* This means that they are placed in the game's environment and recognized by characters in the game's fiction (2013, 23, 150). For Aloy, Sam, Cloud, V, Nilin, Nova and the other player characters shown in screenshots so far, the holograms are present in the world they live in. For them, however, the relationship to the holograms may be completely different than for the player, as the holograms have varying degrees of *ludic* and *ecological* functions, i.e., whether they can influence and be influenced in the virtual environment. Jørgensen's terminology shows that these holograms are presented diegetically and that there are different ways for players to relate to them.

However, it is possible to make some general remarks about game holograms. Although everything from utility tools to non-player characters and the memories of deceased people are depicted holographically in games, none of the games have holographic player characters (which even ghosts have in virtual environments, see Janik, 2019). The lack of playable holographic agents in virtual environments emphasizes holograms’ dissimilarity and their "ghostly" role beyond "our" control. In the case of AIs and the memories of deceased people, the holograms do not have a physical

presence elsewhere in the virtual environment - the medium constitutes their body. When digital worlds visually and mechanically embody what is absent, traditional conceptualizations of ontology are challenged. Furthermore, many of the games are adventure or role-playing games, genres that often require environmental decoration and information. Holograms thus often act to create atmosphere in virtual environments. On the other hand, the holograms of action games tend to be accorded several game mechanics functions.

Although game holograms stand firmly as visual markers for the science fiction category, their aesthetic, narrative, and mechanics functions vary in the play activity itself. In the next section, I will therefore take a closer look at how holographic projections work in *Horizon Zero Dawn*. I want to demonstrate how the holograms make it difficult to distinguish between human and non-human agents in visual representation, identity, and in agency.

Horizon Zero Dawn's archaeological and formative holograms

Back in Aloy's world, one finds a complex story about millennia of AIs, the end of the world, and human hubris, but here follows a simplified introduction. The game is set in a post-apocalyptic landscape where people in tribal-like societies live side by side with machinic animals. At the beginning of the game, some machinic animals have started behaving strangely - as if they are infected - and understanding and fixing this new threat turns out to be anything but easy. The reason is tribal rivalry and internal problems, as well as limited access to the technology on which the pre-apocalyptic society of the "Old Ones" was so dependent. Now dilapidated buildings and forgotten artifacts strewn around the landscape prove how technologically advanced the Old Ones were. Aloy, our protagonist, has one of these artifacts (called the Focus) that enables a display of AR in her field of vision. From a game mechanics point of view, the Focus is a version of a "heads up display" that provides relevant information to the player, but it is presented equally in the fiction for the player character. With her Focus, Aloy can easily locate animals or track blood residue. Most obvious, however, is the Focus' connection to other pre-apocalypse technology: It can find and read hidden holograms in the ruins of Ancient civilization.

The holograms encountered in *Horizon Zero Dawn* are much like holograms in other games: they are not player characters, many do not have a similar physical presence in the virtual environment, and they follow a partially transparent blue-purple design, in addition to participating in creating atmosphere. The holograms also have several roles. The first is as *communication*, talking to each other at the same time, but not in the same geographical location. This is the case between Aloy and Sylens, a researcher with a thirst for knowledge and a fascination with the Old Ones. Sylens contacts Aloy through his own Focus. The holographic telephone makes it possible to have contact with Sylens so that Aloy can process her discoveries along the way. Still, the most notable representations of holograms in *Horizon Zero Dawn* are *memories* - as a recording of something that happened at the same geographical location, but not at the same time. In these representations, holograms allow for exploring borderlands on several levels.

As Aloy unveils the holographic origins of the Old Ones, she also discovers her own lost memories and identity. The borderlands being explored are between human and non-human identities. It turns out that Aloy is simultaneously herself, Dr. Elisabeth Sobeck and the AI GAIA - as well as the player. The story goes as follows: Sobeck makes the AI GAIA. After Sobeck's death, GAIA needs

help from Sobeck and therefore creates a clone (Aloy) based on the same genetic material. Aloy rediscovers the memories of Sobeck and GAIA through holograms of themselves and others. Everything is also experienced by the player. When three-dimensional visualizations of the past appear to the protagonist, the protagonist can *see* and thus remember. Thus, the holographic memories "belong" to Aloy no more than they belong to anyone else: they are shared. For this reason, it is difficult to distinguish between human and non-human agents - even if the terms we operate with indicate otherwise.

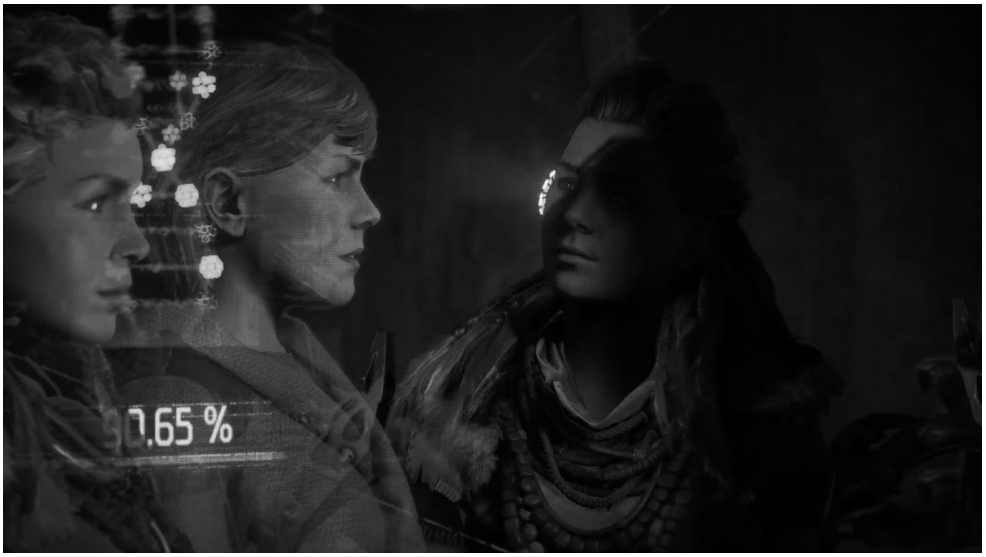

Figure 6 Screenshot from *Horizon Zero Dawn* (Guerrilla Games, 2017).

In this way, the holograms become narrative tools as the story unfolds and the protagonist's memory loss is reset. For Aloy, the rediscovery of the self is not possible without the participation of machines, but the player also depends on machines to participate in this process. In other words, cognition takes place *together with* the technology, both integrated in the game between Aloy and the holograms and between the player and the game. Keogh (2014) points to such a distribution when he identifies how playing games is a mediation or process where memories construct the self *between* the player and non-human agents. Keogh calls this cybernetic memory and describes it as memories that are distributed between humans and technology (2014, 241). Cybernetic memories are reminiscent of Hayles' (2017) cognitive assemblages, in which human and non-human factors work together on several levels. In the next section, I explore these borderlands between agents in navigable cutscenes and how they affect agency in the game when both holograms and playing are understood in a posthumanist perspective.

Holograms as agents

The holograms' aesthetic presentation as a medium and their narrative function as information carriers make them recognizable visualizations of collaborating with the game as a system - and sometimes, the game is in the driver's seat. Although the holograms are only partly visually present, they are programmed elements that take up space in the virtual environment (Aloy cannot go through them)

and they require playing time - set in cutscenes - where the player and Aloy must allow them to carry out their actions again. In this way, holograms allow for understanding the degrees of different game agents' presence and agency, regardless of whether the agents are in the virtual environment, between, or outside. One of the most debated areas in game studies for such vague boundaries is cutscenes.

First things first: If you have played a game, especially an adventure or action game, the chances are high that your ability to take specific actions in the game has been "stopped" in favor of a film that shows what is happening. The first hologram Aloy from *Horizon Zero Dawn* meets, of a father congratulating his child on their birthday, is such a sequence that does not invite direct action on the part of the player. These are called cutscenes, and Klevjer (2002) explains that they are cinematic parts of the game that address the reader in us and put the player on hold. In game studies, cutscenes have often been harshly criticized: Newman (2002) calls it "offline", Galloway (2006, 11) a "cinematic interlude" which he refers to as a grotesque glorification of the game as a machine where the player is forgotten by the game. Cutscenes often end up as targets when the topic is agency.

Contrary to what one might believe from Newman's and Galloway's explanations, cutscenes do not break from the game. Instead, they are integrated into game mechanics by virtue of being "pre-telling" narratives that prepares for a mimetic event: Cutscenes strengthen rhetorical and diegetic dimensions for future events (Klevjer, 2002). According to Klevjer, cutscenes also require attention in a different way than intense action, which gives a certain rhythm to the game. In addition to the rhythmic, Klevjer mentions that a cutscene can function as a visual planning tool for what is to come or as a catapult where the tension increases and ends by throwing the player character into the action. Such sequences have a clear narrative function, even though they are often the result of technical prerequisites - exclamations such as "it's a film!" in gaming in childhood were common because the cutscenes could easily surpass the graphics in the more action-based parts.

Several holograms build on Klevjer's (2002) pre-telling narratives and challenge the idea that the player is forgotten by the game (Galloway, 2006). In *Horizon Zero Dawn*, a striking number of cutscenes are based on holographic film footage from the pre-apocalypse society and faced with the footage Aloy is supposed to observe and not interact. In Klevjer's words, they address the "reader" in Aloy instead of the "player". The story that takes place in three-dimensional blue pixels has already been constructed and Aloy cannot influence this. She sees how scientists and leaders who lived a long time ago discuss how to stop the end of the world, knowing that they are unable to avoid apocalyptic changes. Still, at several such points in the game, the player/Aloy can still move around and look at what they want. Aloy's agency, here and now, revolves around something that has been mediated and filmed in the past. The holographically represented characters are present materially as game objects, but the events have already happened.[7] Put another way, the player and Aloy do not play the memory, nor only see it. The player and the player character share agency with the holograms.

One reason why Aloy can move here may be technically motivated: In the same way that games have struggled and played with perspective for years, this navigation lets the player control the cut and proximity to what is happening. Keeping the perspective with Aloy in the third person creates continuity with the rest of the game that approaches the way we look at people (Galloway, 2006, 65). Fictionally, it makes sense to control the perspective according to where the holograms are and to follow the characters until the conversation ends.

That said - and since there is still a certain degree of game mechanics available for the player - neither the action nor the perspective needs to relate significantly to the diorama that unfolds. "My" Aloy can just as easily be the worst meeting participant of all time and run around in a circle or jump up on the conference table with her face turned away from what is happening. Without being dedicated to fiction, the hologram results in a kind of radio for the player, where you do other things while listening to what is being said - which negates the point of visualizing the hologram. Consequently, the player and the player character must ideally relate to the holograms on the premise of the holograms. Usually, cutscenes "force" the player into an observational role, still active (in Klevjer's use of the word), but not with as much codetermination as in the rest of the game. In the hologram sequence mentioned here, the player character Aloy is also put in an observational role, still active, but not with as much codetermination as in the rest of the game. This connects the player and parts of the game more closely together, while other parts of the game are in the driver's seat. Both cutscenes and holograms illustrate non-human agency.

Figure 7 Screenshot from *Horizon Zero Dawn* (Guerrilla Games, 2017).

How can one understand the holograms in these situations? One way is through looking at the holograms as agents in themselves. As mentioned in the introduction, a posthumanist perspective helps to conceptualize agency in games as distributed. The concept of "distributed agency" (Hayles, 1999, 2017; and others) means that actions are distributed in complex networks between several agents, regardless of whether the agents are people, nature, or technology. These networks, called assemblages, consist of agents who work together and are interdependent. In a posthumanist perspective, it is thus about the actions of more than human agents in isolation - non-human agents are equally important. Although Hayles does not write about virtual environments in her research, this non-anthropocentric approach provides a basis for understanding how holograms contribute to the assemblage. The conceptualization leads to the holograms being treated as agents on an equal footing with, for example, the player character, which contrasts with the player characters' almost hegemonic status elsewhere in the game medium.

Furthermore, the contribution of the game holograms in the assemblage can be examined both diegetically (within the virtual environment) and in their meeting with the player. By "meeting with the player" I mean, for example, how I press a set of buttons while the system performs a whole series of processes when I/we stretch Aloy's bow while hunting in *Horizon Zero Dawn*. The system's response to me causes me to press multiple buttons, and so on. Together we stretch the bow and prepare Aloy for battle through a system of agents and actions. In my analysis, the diegetic and the extradiegetic are interpreted together as the holograms mediate "twice", both for the player character and for the player. In other words, the player character encounters technology (hologram) in parallel with the player encountering technology (game). Hayles' (1999, 2017) viewpoint can be used to see that the focus is therefore not only on the player's agency, but also on the other agents who operate with the player to enable play. The holograms - especially holographic representations of characters - thematize the concept of distributed agency in, between, and outside virtual environments.

The holograms in *Horizon Zero Dawn*'s navigable cutscenes thematize and play out the sharing of memories and agency with the past and with machines. This shows both the dangers and opportunities of holographic technology: a way for people to become more efficient, expand and multitask, but also to make visible the limitations of our own bodies. The holograms glorify technology's enduring ability to remind and influence, as an equally strong echo or rhythm of what has happened, and become images of an ideal of the machines' perfection - they both *record* and *rescue* information (both "save", see Gallagher, 2018). In holographic form, actions are also situated in the present. In *Horizon Zero Dawn*, dead witnesses from the pre-apocalypse world are reinstated in discourse (and in the world) using the holograms' mediation of historical events. Neither Aloy nor the player directly affects the programmed actions performed by the holograms, but they are still a part of the assemblage. In other words, neither player nor game "has" control here - agency is distributed between them.

Cutscenes with a certain degree of game mechanics are not new in games, but the holograms in *Horizon Zero Dawn* show a marked change in mechanics from the rest of the game where Aloy hunts for giant machine animals or rappels down mountainsides. The technique of letting player characters run around freely within a certain area while the story (mostly dialog) takes place is also seen in *Tacoma* but then the navigable cutscenes constitute most of the game mechanics. In a way, it can be said that the holograms in the action role-playing game *Horizon Zero Dawn* put the *action* game on pause while the *role-playing* game is alive and well. The action part indicates that it is a form of (physical) challenge, in this case responsive and precise archery and similar skills in combat. The role-playing part usually indicates characters who play out a more or less fixed fictional story. A 20–50-hour long game in this style requires breaks and narrative advancement, which cutscenes can be according to Klevjer.

The cutscenes show possibilities within certain limitations, a relationship that fluctuates between machine and player. Of course, one can question whether *Horizon Zero Dawn*'s holograms can be interpreted as cutscenes at all. In games, one often encounters similar cases that are presented as purely organic/diegetic. In *Tacoma*, the player character moves around while the holograms talk, and in *Cyberpunk 2077*, the player character can choose to look at the impressive futuristic city out the window to the left or stare at a champagne shelf to the right in the flying autonomous car they are sitting in, while a holographic phone call goes on the background. Elevator sequences will give the

same spatial limitation, while moving around while you have to finish a dialogue to progress will have the same mechanical limitation. The more one expands these cases, the more one sees that this is how games operate: Collaboration in the assemblage of human and non-human agents enables play.

Playing in the borderlands

The discourse around technology as something people control and master is familiar in gaming culture. For example, the actual play activity will often be explained from a player's point of view, i.e. that the player's ability to start or complete processes in the game is "gameplay". In the same way, games are often mentioned in media and promotional material according to how much freedom of choice and power they allow the player. The player's autonomous power of action and control is in the spotlight. I, and others with me (e.g., Boulter, 2015; Fizek, 2018; Giddings, 2005; Keogh, 2014; Taylor, 2009), believe this is a reductive discourse and a reductive view of gaming. Fizek (2018) writes that since games involve AI and complex relationships between player and player character, one must rethink strict divisions of subject/object and activity/passivity. In other words, if all agents - player, player character, non-player characters, hardware - are treated as part of a larger process, one is forced to reconceptualize what it means to have agency and control in a game context. Posthumanist perspectives allow for the contribution of non-human agents in such assemblages.

Like many other holograms mentioned in this article, the holographic memories in *Horizon Zero Dawn* are captured "between existences" on a semantic and material level (Janik, 2019). They have characteristics defined like other game objects, recognized by game characters, but presented with varying degrees of physical presence. The humans on whom the holographic memories are based died long ago, but in the navigable cutscenes, the holograms may still require some control in the agency when played again. Neither actions nor ontological status is isolated from other agents when meeting with holograms in the game. This can be perceived as a new configuration of agency where it is difficult to distinguish between human and non-human agents, whether in terms of identity, visual representation, or game mechanics. In my opinion, holograms show that there has always been such instability in games. We just have to find a way to describe the gray areas that does not sweep a large part of the assemblage under the rug.

In my exploration of the phenomenon of holograms in games, the way they are positioned in the borderlands between possible answers is both liberating and at the same time frustrating. Although we apparently know what a hologram is by looking at it, there is no single recipe for how to relate to them, whether aesthetically, narratively, or mechanically. Games can, to varying degrees, invite or exclude mechanical interaction with holograms, which contrasts with the way holograms are represented in film and literature. Sometimes holograms are presented as the fantasy of escaping spatiotemporal limitations of being human, sometimes as the remnants when humans are out of the equation. Basically, the holograms are about degrees of visibility: being able to physically see the person you are talking about with, to rotate an object to understand it in three-dimensional form, to trick someone into thinking they see you, to create an extra set of eyes. This explains why players and characters are often thematized as observing when faced with holograms. No holograms are player characters, but they still require the player to recognize them as real characters and meet them on the premises of the holograms. Whether this takes place primarily on a narrative level (Johnny Silverhand in *Cyberpunk 2077*) or primarily on a mechanical level (Nova in *Heroes of the Storm*), the agency of

non-human agents is at least as important as that of human agents in games. Instead of looking at the agency of non-human agents as divisive, holograms help us to see how machine and human are *interconnected* in actions. In this way, holograms become a good starting point for studying how the relationship between hologram technology and the virtual world is reflected in the relationship between player and game. In Aloy's case, she shares agency in the same way she shares memories and biological bases, with the past and the future, with humans and machines, in and outside the virtual environment - through holograms.

This article has outlined a broad cultural understanding of holograms, identified representations of this in 24 games, and further analyzed how the representations work in examples from *Horizon Zero Dawn*. I have demonstrated how a cultural understanding of holograms is alive and well and how the gaming medium expands and challenges this understanding. What remains as my main point is that the holograms become a gateway to explore gray areas in the face of technology and that just as holograms play out the player character's shared agency with machines, we as players also share our agency with the game. Demonstrating such a point through other media (this text and static screenshots) is of course problematic, so I hope the reader accepts the challenge to play some of the games mentioned here. In this way, the way in which holograms help in understanding complex assemblages of human and non-human agents within, between and outside virtual environments will be made even clearer. The games' representation of hologram technology may still not be technically possible outside the virtual environment, but the questions the holograms raise show that we are already playing in the borderlands - the holograms only lend us their spectral hands to give us something tangible to reflect on.

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Cited works

3D Realms. (1996). *Duke Nukem 3D* [Microsoft Windows]. FormGen.

5 Lives Studios. (2015). *Satellite Reign* [Microsoft Windows].

Aarseth, E. (1997). *Cybertext: Perspectives on Ergodic Literature*. The Johns Hopkins University Press.

Aarseth, E. (2011). "Define Real, Moron!" Some Remarks on Game Ontologies. In S. Günzel, M. Liebe, & D. Mersch (Eds.), *DIGAREC Keynote-Lectures 2009/10* (Vol. 6, pp. 50–68). Potsdam University Press. https://publishup.uni-potsdam.de/opus4-ubp/frontdoor/deliver/index/docId/5041/file/digarec06.pdf

Bioware. (2017). *Mass Effect: Andromeda* [Microsoft Windows]. Electronic Arts.

Blizzard Entertainment. (2010). *StarCraft II: Wings of Liberty* [Microsoft Windows].

Blizzard Entertainment. (2015). *Heroes of the Storm* [Microsoft Windows].

Bloober Team. (2017). *>observer_* [PlayStation 4]. Aspyr.

Boulter, J. (2015). *Parables of the Posthuman: Digital Realities, Gaming, and the Player Experience*. Wayne State University Press.

Bungie. (2001). *Halo: Combat Evolved* [Xbox One]. Microsoft Game Studios.

CD Projekt Red. (2020). *Cyberpunk 2077* [Microsoft Windows]. CD Projekt.

Chance Agency. (2019). *Neo Cab* [Microsoft Windows]. Fellow Traveller.

Croteam. (2014). *The Talos Principle* [Microsoft Windows]. Devolver Digital.

Daedalic Entertainment. (2018). *State of Mind* [Microsoft Windows].

Dontnod Entertainment. (2013). *Remember Me* [Microsoft Windows]. Capcom.

Eidos Montréal. (2011). *Deus Ex: Human Revolution* [Microsoft Windows]. Square Enix.

Elmahal, D. M., Ahmad, A. S., Alomaier, A. T., Abdlfatah, R. F., & Hussein, D. M. (2020). Comparative Study between Hologram Technology and Augmented Reality. *Journal of Information Technology Management*, *12*(2), 90–106. https://doi.org/10.22059/jitm.2020.75794

Fizek, S. (2018). Automation of play: Theorizing self-playing games and post-human ludic agents. *Journal of Gaming & Virtual Worlds*, *10*(3), 203-218(16). https://doi.org/10.1386/jgvw.10.3.203_1

Fullbright. (2017). *Tacoma* [Microsoft Windows].

Funcom. (1999). *Den Lengste Reisen* [Microsoft Windows].

Gallagher, R. (2018). Memory and Meaning in Analogue: A Hate Story and Nier: Automata. *Abstract Proceedings of the 2018 DiGRA International Conference*. DiGRA ’18 – The Game is the Message. http://www.digra.org/digital-library/publications/memory-and-meaning-in-analogue-a-hate-story-and-nier-automata/

Galloway, A. R. (2006). *Gaming: Essays on Algorithmic Culture* (Vol. 18). University of Minnesota Press.

Gearbox Software. (2019). *Borderlands 3* [Microsoft Windows]. 2K Games.

Giddings, S. (2005). Playing With Non-Humans: Digital Games as Techno-Cultural Form. *DiGRA ’05 - Proceedings of the 2005 DiGRA International Conference: Changing Views: Worlds in Play*. DiGRA 2005. http://www.digra.org/wp-content/uploads/digital-library/06278.24323.pdf

Giddings, S., & Kennedy, H. W. (2008). Little Jesuses and *@#?-off Robots: On Cybernetics, Aesthetics, and Not Being Very Good at Lego Star Wars. In M. Swalwell & J. Wilson (Eds.), *Pleasures of Computer Gaming: Essays on Cultural History, Theory and Aesthetics* (E-book, pp. 13–32). McFarland & Company.

Guerrilla Games. (2017). *Horizon Zero Dawn* [PlayStation 4]. Sony Interactive Entertainment.

Hayles, N. K. (1999). *How We Became Posthuman*. The University of Chicago Press.

Hayles, N. K. (2017). *Unthought: The Power of the Cognitive Nonconscious*. University of Chicago Press.

Janik, J. (2019). Ghosts of the Present Past: Spectrality in the Video Game Object. *Journal of the Philosophy of Games*, *1*. https://doi.org/10.5617/jpg.2943

Johnston, S. F. (2016). *Holograms: A Cultural History*. Oxford UP.

Jones, A. P. (2019). The Haunting Aesthetics of Tacoma. *Games and Culture*, 155541201989440. https://doi.org/10.1177/1555412019894400

Jørgensen, K. (2013). *Gameworld Interfaces*. The MIT Press.

Keogh, B. (2014). Cybernetic Memory and the Construction of the Posthuman Self in Videogame Play. In D. M. Weiss, A. D. Propen, & C. E. Reid (Eds.), *Design, Mediation, and the Posthuman* (pp. 233–247). Lexington Books.

Klevjer, R. (2002). In Defense of Cutscenes. *Computer Games and Digital Cultures Conference Proceedings*, *1*.

Kojima Productions. (2019). *Death Stranding* [PlayStation 4]. Sony Interactive Entertainment.

Kronman, L. (2020). Intuition Machines: Cognizers in Complex Human-Technical Assemblages. *APRJA: A Peer-Reviewed Journal About*, *9*(1), 54–68. https://doi.org/10.7146/aprja.v9i1.121489

Lucas, G. (1977). *Star Wars: Episode IV - A New Hope*. 20th Century Fox.

Newman, J. (2002). The Myth of the Ergodic Videogame: Some thoughts on player-character relationships in videogames. *Game Studies*, *2*(1). http://www.gamestudies.org/0102/newman/

Parrent, K. L. (2017). *Holo-pursuits: Holographic identity & agency in Star Trek: The Next Generation & Voyager* [University of Canterbury]. https://ir.canterbury.ac.nz/handle/10092/14664

PlatinumGames. (2017). *NieR: Automata* [PlayStation 4]. Square Enix.

Rettberg, J. W. (2019). Et algoritmisk blikk. *Norsk medietidsskrift*, *26*(01), 1–20. https://doi.org/10.18261/ISSN.0805-9535-2019-01-03

Rettberg, J. W., Gunderson, M., Kronman, L., Solberg, R., & Stokkedal, L. H. (2019). Mapping Cultural Representations of Machine Vision: Developing Methods to Analyse Games, Art and Narratives. *Proceedings of the 30th ACM Conference on Hypertext and Social Media - HT '19*, 97–101. https://doi.org/10.1145/3342220.3343647

Rettberg, J. W., Kronman, L., Solberg, R., Gunderson, M., Bjørklund, S. M., Stokkedal, L. H., & Jacob, K. (2021). *Machine Vision in Art, Games and Narratives* [Research database]. https://machine-vision.no/

Richardson, M., & Wiltshire, J. D. (2018). *The Hologram: Principles and Techniques*. Wiley-IEEE Press.

Square Enix. (2020). *Final Fantasy VII Remake* [PlayStation 4].

Taylor, T. L. (2009). The Assemblage of Play. *Games and Culture*, *4*(4), 331–339. https://doi.org/10.1177/1555412009343576

Ubisoft Montreal. (2013). *Assassin’s Creed IV: Black Flag* [PlayStation 4]. Ubisoft.

Ubisoft Montreal. (2015). *Tom Clancy’s Rainbow Six Siege* [Microsoft Windows]. Ubisoft.

Ubisoft Toronto. (2020). *Watch Dogs: Legion* [PlayStation 4]. Ubisoft.

Unknown Worlds Entertainment. (2016). *Subnautica* [Microsoft Windows].

Virtual Image Productions. (1991). *Time Traveler*. Sega.

Notes

1 Jenkins, M. (2018, July 5th). This singer is part hologram, part avatar, and might be the pop star of the future. *Washington Post*. Retrieved from https://www.washingtonpost.com/entertainment/music/this-singer-is-part-hologram-part-avatar-and-might-be-the-pop-star-of-the-future/2018/07/05/e2557cdc-7ed3-11e8-b660-4d0f9f0351f1_story.html

2 Tsukayama, H. (2012, April 18th). How the Tupac ‘hologram’ works. *Washington Post.* Retrieved from https://www.washingtonpost.com/business/technology/how-the-tupac-hologram-works/2012/04/18/gIQA1ZVyQT_story.html

3 BBC News (2020, October 30th). Kanye West gives Kim Kardashian birthday hologram of dead father. *BBC News.* Retrieved from https://www.bbc.com/news/entertainment-arts-54731382

4 Called a holographic game in *The One Magazine* in 1991. Issue 36 (September 1991), p. 96, taken from https://archive.org/details/theone-magazine-36/page/n95/mode/2up

5 There are mostly fluid transitions in cases where AR technology helps the player character to see holograms, e.g. in *Watch Dogs: Legion* (Ubisoft, 2020), in *Tacoma* (Fullbright, 2017) and in *Remember Me* (Dontnod Entertainment, 2013). These are all included in the "memory" group, which may indicate that the storage function may be the reason why these technologies blend into each other. For Aloy in *Horizon Zero Dawn*, it can be argued that the Focus is AR technology that starts other hologram technology and/or, since the projection from the device is visible, that it is a portable hologram projector. In any case, the "film footage" of people is presented in *Horizon Zero Dawn* as holograms ("hologram datapoints").

6 A player can also be a non-human player, e.g. AlphaStar, an AI that has beaten professional (human) players in the complex strategy game *Starcraft II* (Blizzard Entertainment, 2010).

7 The closest one gets to something similar is the "found footage" phenomenon, but these are not cutscenes - games that mimic this effect either set the recording in the present (and thus remove the

"found" part of the word, as in *Outlast* (Red Barrels, 2013) or do not allow for player character-based playability in the actual viewing of the recording (such as *Her Story* (Barlow, S. 2015)).

Article III

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Surveillance & Society

Article

(Always) Playing the Camera: Cyborg Vision and Embodied Surveillance in Digital Games

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Abstract

As the increasingly ubiquitous field of surveillance has transformed how we interact with each other and the world around us, surveillance interactions with *virtual* others in *virtual* worlds have gone largely unnoticed. This article examines representations of digital games' diegetic surveillance cameras and their relation to the player character and player. Building on a dataset of forty-one titles and in-depth analyses of two 2020 digital games that present embodied surveillance camera perspectives, *Final Fantasy VII Remake* (Square Enix 2020) and *Watch Dogs: Legion* (Ubisoft Toronto 2020), I demonstrate that the camera is crucial in how we organize, understand, and maneuver the fictional environment and its inhabitants. These digital games reveal how both surveillance power fantasies and their critique can coexist within a space of play. Moreover, digital games often present a perspective that blurs the boundaries between the physical and the technically mediated through a flattening of the player's "camera" screen and in-game surveillance cameras. Embodied surveillance cameras in digital games make the camera metaphor explicit as an aesthetic, narrative, and mechanical preoccupation. We think and play with and through cameras, drawing attention to and problematizing the partial perspectives with which worlds are viewed. I propose the term cyborg vision to account for this simultaneously human and nonhuman vision that's both pluralistic and situated and argue that, through cyborg vision, digital games offer an embodied experience of surveillance that's going to be increasingly relevant in the future.

Introduction

Most of us don't walk around on the street destroying surveillance cameras, or hack into governments' private security video feeds. Only a few of us will have access to surveillance monitors, and even fewer will be able to interact with what's broadcasted on these screens. None of us have the power to fully embody a machine. Yet in several digital games (hereafter: games), these actions and perspectives aren't just within reach but part of the very premise of the virtual environment. If you've spent some time playing games, chances are that you've encountered a surveillance camera or five, often in complex surveillance assemblages. As Batman (Rocksteady Studios 2011), you destroy surveillance cameras. As Marcus (Ubisoft Montreal 2016), you hack into them. As Amanda (Rival Games 2019), you protect people through them. As SAM (No Code 2019), you *are* the camera. Whether it's using this camera access to fight an oppressive employer (Camouflaj 2013), risking your life to spy on your enemies (InnerSloth LLC 2018), or being forced to re-watch recordings of one's own murderous spree (Rockstar North 2003), surveillance cameras influence how we play.

Although increasingly ubiquitous surveillance has transformed how we interact with each other and the world, interactions related to surveillance with *virtual* others within *virtual* worlds have gone largely unnoticed. In other words, we might know a lot about how one imagines the oppressive surveillance surrounding Winston Smith in *Nineteen Eighty-Four* (Orwell 2013), yet scarcely anything is known about the multitude of game representations of surveillance. Lyon (2018: 148) remarks that, in literature, we can

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ask how a novel's characters are meant to "comply, cope or question" surveillance situations that arise. I propose to further this question into the realm of games and to player characters, which are the main agents in the virtual environment that the player "controls" and experiences the environment through. I would argue that games are especially salient for research on surveillance assemblages because they, like contemporary surveillance, can't be seen in a stereotypical top-down power relationship. Rather, the player of a game is always in a feedback loop where they simultaneously control and are controlled, act and are acted upon, and make choices enabled and constrained by hardcoded rules. Moreover, games can emphasize or comment on contemporary societal tendencies and politics, and they directly engage with questions of technology's role in everyday life. Games about surveillance, specifically, can function as Bogard's (1996) "imaginary machines" or speculative visions that allow us to play out different responses to surveillance pasts, presents, and futures. This article therefore begins by asking how player characters—and by extension, players—are meant to "comply, cope or question" the situations that arise through the presence of the surveillance camera.

In particular, this article looks at the common trope of experiencing the virtual environment through a surveillance camera. These surveillance cameras blur the boundaries between the physical and the technically mediated through a flattening of the player's "camera" screen and in-game cameras. It's a synchronized vision of technological imaging processing and human perception. Players must learn to see in a way that is simultaneously their embodied vision and the nonhuman vision of the camera (and its viewers), what Christiansen (2016) identifies as the tension between technological and human vision, or what I, inspired by Haraway (1991), will term cyborg vision. I define cyborg vision as a simultaneously human and nonhuman vision that is pluralistic yet situated. Although cyborg vision is a rare experience for most people, it's common in games. Following the medium's tradition of camera representation, players already inhabit a partial vision. Through the representation of surveillance cameras, cyborg vision is made explicit. Located in this in-between space, this article supports a line of conceptualizing human-technical assemblages that acknowledges nonhumans as agents and emphasizes partial embodiment (Haraway 1988, 1991; Hayles 2016, 2017). Assemblages are here understood as a type of scalable, interconnected, and dynamic network (Hayles 2016) comprised of agents such as "system, technologies, player, body, community, company, legal structures, etc." (Taylor 2009: 332). Such an understanding includes seeing screens and indeed cameras as agents in their own right (Haraway 1988: 592). Thus, the camera becomes an important agent between virtual environments and the physical world as well as within virtual environments.

Starting from the camera's presence in the virtual environment, I first present an overview of forty-one games featuring diegetic surveillance cameras. After a discussion of the medium's requirement to control and play within camera-like limits, I examine the connection between player character actions and representations of embodied surveillance cameras in two 2020 games: *Final Fantasy VII Remake* (Square Enix 2020) and *Watch Dogs: Legion* (Ubisoft Toronto 2020). *Final Fantasy VII Remake* typifies the aesthetical imaginaries tied to surveillance cameras. Moreover, the player character's response to oppressive surveillance is acquiescing to its existence, even if players are painfully aware of transgressions taking place. Contrary to this, *Watch Dogs: Legion* presents the surveillance power fantasy—controlling the environment and its inhabitants through surveillance cameras in the name of protection, investigation, and survival—while at the same time commenting on the power it holds through hacking, subverting, and even destroying surveillance technologies. Throughout the article, I argue that games offer an embodied experience of surveillance through cyborg vision, one that's going to be increasingly relevant in our near future. By examining aesthetic, narrative, and mechanical elements of games we see that camera surveillance is much more than watching, and that cyborg vision can be generative in understanding agencies and power in games and surveillance alike. As objects and interfaces, as representations of surveillance structures, as mediating lenses, and as characters of partial embodiment, surveillance cameras in games allow for experiencing cyborg visions where human and nonhuman agents are intertwined in playing the camera.

Background and Method

Connections between surveillance studies and game studies have previously explored how game design elements are implemented into surveillance technologies and practices (Benjamin 2019; Koskela and Mäkinen 2015; Mäkinen 2017; Whitson 2015). Others have looked at playful representations of surveillance in popular culture in general (Marx 1996), game community related surveillance such as community management and paratext (Kerr, Paoli, and Keatinge 2014), surveillance of players and streamers (Taylor 2016), and how games and gaming platforms often are constructed as surveillance structures (e.g., Cybulski 2014; Wang, Haines, and Tucker 2011) or presented to the *player* as surveillance structures (Albrechtslund and Dubbeld 2005). Largely missing from these reports is that the games themselves are treasure troves of surveillance imaginations and practices. Games are an important source of analysis for how different agents, including nonhuman agents and their agency, influence assemblages of play (Giddings 2005). Acknowledging the complexity and significance of games as an influential cultural form can thus present new conceptualizations of surveillance cultures.

The scope of this article is the representation of diegetic surveillance camera technology in late twentieth-century and early twenty-first-century games. A diegetic representation presents the camera as part of what Juul (2005: 165) calls the "game space," which is the virtual environment in which players navigate. Diegetic cameras are legitimized within the virtual environment in different ways. The most common representation is as an object/design feature or a series of camera interfaces in a grid (like a security monitor room). Moreover, games often present a world *through* the object, as an interface from the camera's perspective. Focusing on diegetic legitimacy differentiates these cameras from interface studies where the interface can be presented extradiegetically (see, e.g., Jørgensen 2012), which means that its purpose is solely for the player's navigation of a space rather than part of the fictional environment's narrative. Diegetic legitimacy also avoids making *all* games into surveillance games when there's nothing within the fiction that refers to a godlike entity spying on them (as is the case with *The Sims* in Albrechtslund and Dubbeld 2005: 218). Although power disparities in such cases are an interesting field of study, this article is limited to games where surveillance is part of the fiction, bringing new perspectives to the emerging scene of scholarly investigations in playful interactions with surveillance.

More specifically, this article examines games that represent closed circuit television (CCTV) and internet protocol (IP) cameras and to what extent these cameras are incorporated into narrative and game mechanics. CCTV/IP cameras are fixed in location and observe a designated area, e.g., home surveillance. These objects hang on a wall, over a door, or in a streetlamp where they, according to Finn (2012), function as rhetorical devices. They guarantee the truthfulness of the environment and become symbols of a known present or near future techno-dystopia. Their visibility varies; some are partially hidden to find the information they need, whilst big signs stating that you're being monitored can accompany others. CCTV/IP cameras often rotate on their own axis, giving a large field of vision from a given position, and are frequently presented as networked security cameras broadcasting live to an external screen. Clearly, CCTV/IP camera presence immediately connects to ideas of protection, exclusion, and power.

For this article, I assembled a sample of games that feature surveillance cameras that the player character acknowledges or with which they interact (see Table 1).[1] This dataset is inspired by community driven wikis on the topic (Giant Bomb n.d.) and the systematic cataloguing of the "soda machine project" to catalog every soda vending machine in games (Morrissette 2020). My dataset isn't an exhaustive list but a strategic

[1] Note that games in the same series that feature surveillance cameras are registered with one representative title (the two Tom Clancy games belong to their own series). By selecting one title, this approach loses the distinction of influential works, such as the blockbuster WATCH_DOGS series' importance in surveillance camera representation. At the same time, it prevents an influx of similar data when it comes to very large bodies of games in the same series, such as the *Assassin's Creed* series (currently standing at twelve main titles and even more spin-off titles). Additionally, the list doesn't include games that are known to feature surveillance camera interactions but that weren't accessible for play, e.g., *Surveillance Kanshisha* (Sony Computer Entertainment Inc 2002) and Lifeline (Sony Computer Entertainment Japan 2003).

sample of games that I played, analyzed, and entered into a database for representations of machinic vision in popular culture (Rettberg et al. 2019, 2021). The focus on the player character's relation to surveillance cameras emerged from playing the games and seeing differences in how they presented positioning and power relations between different agents of surveillance. Tracing links and tension points between games' aesthetics, narratives, and mechanics on the one hand and surveillance on the other shows that diegetic cameras influence perception and action. Particularly, the prevalence in which technical surveillance intermittently or constantly merges the gaze of the machine, the player character, and the player stood out. When the perspective is that of an embodied surveillance camera, these games prompt us to consider the complex surveillance assemblages therein as well as the way in which the interface insists on the camera's materiality while subtly transforming player vision.

Year	Title	Developer	Embodied camera
1987	Metal Gear	Konami	
1992	Night Trap	Digital Pictures	
1997	Goldeneye 007	Rare	
2001	Vigilance 1.0	Le Chevallier	
2003	Manhunt	Rockstar North	X
2004	Half-Life 2	Valve	
2007	Bioshock	Irrational Games	
	eXperience112	Lexis Numérique	X
	Portal	Valve	
2008	Mirror's Edge	EA DICE	
2011	Deus Ex: Human Revolution	Eidos-Montréal	
2012	Sleeping Dogs	United Front Games	
2013	Assassin's Creed: Black Flag	Ubisoft Montréal	X
	Grand Theft Auto V	Rockstar North	X
	Remember Me	Dontnod Entertainment	
	République	Camouflaj	X
2014	Five Nights at Freddy's	Cawthon	X
	Nothing to Hide	Case	
	The Castle Doctrine	Rohrer	
2015	Batman: Arkham Knight	Rocksteady Studios	X
	Clandestine	Logic Artists	X
	Mon strum	Team Junkfish	
	Satellite Reign	5 Lives Studios	
	Technobabylon	Technocrat Games	X
	Tom Clancy's Rainbow Six Siege	Ubisoft Montréal	X
2016	Beholder	Warm Lamp Entertainment	
	Orwell	Osmotic	X
2017	Tom Clancy's Ghost Recon Wildlands	Ubisoft Paris/Milan	
2018	Among Us	InnerSloth	
	Detroit: Become Human	Quantic Dream	X
	Do Not Feed the Monkeys	Fictiorama Studios	
	I'm on Observation Duty	Zaster	X
	State of Mind	Daedalic Entertainment	X
2019	Alien: Blackout	Rival Games	X
	Astral Chain	PlatinumGames	
	NITE Team 4	Alice & Smith	
	Observation	No Code	X
2020	Cyberpunk 2077	CD Projekt RED	X
	Final Fantasy VII Remake	Square Enix	X
	Ministry of Broadcast	Ministry of Broadcast Studio	
	Watch Dogs: Legion	Ubisoft Toronto	X

Table 1: *Forty-one games with diegetic surveillance camera acknowledgment and/or interaction.*

It's worth noting that games feature diegetic surveillance technologies and strategies beyond CCTV/IP cameras. Games like *Voyeur* (Philips POV Entertainment 1993) and *Unmanned* (Molleindustria 2012) show surveillance through a camcorder and a drone, respectively. *AI: The Somnium Files* (Chunsoft 2019) represents biometric surveillance through an artificial intelligence ocular implant and *Papers, Please* (3909 LLC 2013) shows nontechnical surveillance and power. Thus, the findings of this article shouldn't reduce the need for a broad concept of surveillance games nor future research on the topic.

Thinking Like a Camera

Technologies not only increasingly mediate our relationship with the physical world, like surveillance cameras do, but also with virtual environments, as games do. Before looking at specific game representations of embodied surveillance cameras, it is necessary to understand that cameras have a longstanding history in games. Artistry and utility cooperate in games, which is especially evident in the metaphor of the player camera. Game cameras are engines for experiencing the virtual environment. As explained by Thon (2009), perspective in games is often spoken of in terms of camera position, partly because the terminology originates from film theory. Indeed, the concept of "camera" is a way for players to make sense of the play experience with clear links to a cinematic mindset (Krichane 2021). We therefore find terms such as "first person" and "third person" in games. A camera's position controls player perception and sometimes these spatial and perceptual perspectives (Thon 2009) can merge into the same visual effects for player characters and players. For instance, consuming alcohol within *World of Warcraft* (Blizzard Entertainment 2005) causes blurriness on the player's screen. In the same game, the player can choose whether to play in a first or third-person camera position. This camera (a "virtual camera" in Krichane 2021) isn't thematized like diegetic cameras are. Rather, it appears as a window into this world that the player now—through their player character—inhabits. I, as others before me (e.g., Thon 2009), would point out that this doesn't mean that players uncritically adopt a player character's attitude or position. However, it shows how impactful perspectives are in understanding a particular character, situation, and world.

In the early days of the medium, static views were necessitated in part by technological limitations, most notably seen in 2D platform games, point-and-click adventure games, and full motion video games (FMVs). The rigidity of cameras justifies the fixed perspectives through which we view these games. One such example is the FMV *Night Trap* (Digital Pictures 1992). In *Night Trap*, the player is a security guard tasked with monitoring a house to save innocent girls from vampires. The guard's actions are limited to switching between cameras installed throughout the house and triggering traps that, in turn, initiate already filmed sequences where the vampires are (hopefully) caught. Thus, the camera legitimizes which actions are available to the security guard player character. A *Night Trap* where the guard blasts into the house with a bazooka would be a very different *Night Trap* indeed. It would probably also require a lot more of the processing system than what was offered at the time, showing how technological limitations inform the construction of these environments.

The link between diegetic cameras and extradiegetic cameras is perhaps even more evident when giving perspectival freedom to the player. Perspectival freedom must account for several possible perspectives in each scene, which requires more processing power and storage capacity in the game system, while simultaneously convincing the player to accept this as a coherent part of the virtual environment on a design level. Framing perspectival freedom as a diegetic camera became a solution to help remedy these design and programming challenges. Consider the camera in *Super Mario 64* (Nintendo 1996), where the one-sided fixed viewpoint that was common at the time was replaced with players choosing their own perspective. The player controls the plumber Mario on his quest to save Princess Peach from the evil Bowser. To remedy the aforementioned perspectival problems, the designers created the Lakitu Bros; flying camera operators that the player can utilize to change their view. Thus, the metaphor for *why* the player can change the perspective on the same scene is introduced. As explained within the virtual environment, neither the player nor Mario change perspectives—a Lakitu does. A Lakitu is presented within the fictional world as a news reporter "reporting live" from where "Mario has just arrived on the scene" (Nintendo 1996). This links 3D exploration with "thinking like filmmakers" (Vishnevetsky et al. 2016) or even thinking like the camera:

What perspective will give the best overview in this particular scene? Which limitations and possibilities does this character introduce? As a result, in *Super Mario 64*, the player isn't just Mario. Players not only control Mario's movements but also a Lakitu and their camera. However, apart from the brief introduction and perhaps a glimpse in a mirror, the Lakitu is hidden. They're hidden to the extent that if/when Mario dies, the Lakitu only watches (Vishnevetsky et al. 2016). The camera doesn't intervene, similar to static CCTV/IP cameras.

Consequently, diegetic cameras in games are important on aesthetic, narrative, and mechanical levels. For both *Night Trap* and *Super Mario 64* alike, there is no game without the camera. Conversely, a player probably wouldn't notice being placed in a camera's perspective because perspectival changes are common aesthetic features in games. Players are used to navigating and accepting different perspectival positions in virtual environments. The cameras we encounter are thematically important as metaphors of capturing, creating, and looking into other worlds, but because this is often presented as a "regular" interface, the camera is only another entry point in its immediacy. Yet as shown, a fixed camera view is designed to provide or limit possibilities for action, because what and how you see influences what you can do in virtual environments (e.g., Juul 2003). When this viewpoint is presented as a surveillance camera, it's further embedded in the virtual environment.

Location, Location, Location

Games change the embodied experience of surveillance. My use of the concept of embodiment is inspired by Haraway's (1988) feminist epistemology. In short, embodiment is about knowing *from somewhere*. Haraway (1988) uses the metaphor of vision to explain how knowledge is constructed and experienced from a position—which incidentally further imbricates Haraway with surveillance studies. One might fantasize about the possibility of an objective and godlike view from above, but Haraway (1988) reminds us that any observer is both enabled and limited by their context. These possibilities and restrictions dictate what and how they see. Technical and organic eyes alike build on "specific *ways* of seeing" (Haraway 1988: 583). The emphasis on the context in which knowledges are produced is theorized by Haraway (1988) as "situated knowledges." Situated knowledges aren't about "being" in a body but "splitting" and inhabiting multiple perspectives at once.

The concept of situated knowledges has previously proven fruitful to surveillance studies, noting that surveillance is always situated (Gad and Lauritsen 2009). This means that surveillance is part of a specific cultural and material context, and the interaction between surveillance technologies and humans is what creates a certain way to the see world. By using Haraway's (1988) concept, we can go from solely focusing on surveillance *of a body* to including multiple agents and considering surveillance *as a body*. The latter has received little attention because it involves hidden agents and uninhabitable perspectives. We have to negotiate nonhuman embodiment because, following Christiansen (2016), surveillance cameras are usually located in places humans can't occupy (e.g., in ceiling corners). In close to half of the games in the dataset (nineteen of forty-one), however, these camera perspectives are no longer uninhabitable but embodied.

To grasp how embodiment can be situated yet transgress boundaries, Haraway (1991) introduces the imaginative resource of the cyborg. The concept reads as a liberative force against patriarchy, but for this article, it specifically helps to nuance the experiences of individual agents in an assemblage and how one can be multiple at once. A cyborg is "a hybrid of machine and organism, a creature of social reality as well as a creature of fiction" (Haraway 1991: 149). Cyborgs construct bodies that are "permanently partial," are "disassembled and reassembled," and "suggest a way out of the maze of dualisms in which we have explained our bodies and our tools to ourselves" (Haraway 1991: 154, 163, 181). In other words, a cyborg is both pluralistic and situated.

I would argue that players are already adept at cyborg partiality. Games have indeed been described as cyborgian in how they transgress the boundaries of human and technology (Boulter 2015; Giddings 2009; Keogh 2016). The cyborg vision that arises from this conceptual character is not to be confused with the

proliferation of cyborg characters in games but signals a partial embodied vision between character perspectives—for instance, between *Night Trap*'s security guard and security cameras. Stated differently, cyborg vision is a discorrelation (Denson 2020) of vision from human subjectivity and perspective that I, using Haraway's (1988, 1991) concepts, place back into embodied forms. In games, cyborg vision can be considered on a diegetic level but will also include the experience of a player's own embodied vision merging with the vision of a player character and/or with the nonhuman vision of the surveillance camera. In this sense, players pioneer cyborg vision. Playing a game happens in the interrelation between the physical world and virtual environment, yet we rarely stop (or are stopped) to consider that we're simultaneously our physical body and a virtual body, mediated through a screen. Thus, cyborg vision isn't a novel experience for players, but it can hide surveillance cameras in plain sight behind the habitualized mechanics of games.

Final Fantasy VII Remake, Surveillance Aesthetics, and the Power to See

In the action role-playing game *Final Fantasy VII Remake* (Square Enix 2020), surveillance cameras are ever present but only interactive on a narrative level. The citizens of the fictional metropolis Midgar and Cloud, the primary player character, are certainly acquainted with surveillance cameras. Cloud is a former elite soldier turned mercenary, fighting alongside the vigilante eco-terrorist group Avalanche to save the planet from the de facto government of the mighty Shinra Electric Power Company. Shinra uses the very essence of the planet as an energy source, slowly killing the planet in the process. Within Midgar, their massive corporate tower looms over the circular city as a panoptical center, ready to process intelligence from their extensive surveillance network. This network includes fighter drones, biometric scanner checkpoints, and surveillance cameras. At the helm of the system is Shinra's head of "Public Safety" (the military), a proponent of instrumentalization at all costs ironically named Heidegger.

The traditionally top-down panopticism associated with surveillance cameras is presented from a partial perspective in *Final Fantasy VII Remake*. To clarify, the player always sees Cloud in a third person perspective (hovering slightly behind the player character like the Lakitu Bros in *Super Mario 64* but without the thematized camera control). However, when surveillance cameras enter the mix, this perspective is both thematized and aestheticized. Several times, the player is "taken away" from Cloud's immediate presence and instead presented with Heidegger's view from Shinra's security monitor room.[2] Here, Heidegger watches intently as Avalanche tries to infiltrate Shinra headquarters. After presenting Heidegger's perspective, one of the camera feeds becomes superimposed on the player's screen. It shows the perspective not of Heidegger nor of Cloud but rather a third person view aestheticized as a camera. It's still similar to the player perspective of the rest of the game, but instead of "being Cloud," the player sees Cloud and two Avalanche members in the middle of the frame, their bodies targeted with a motion tracking crosshair symbol. Naturally, the visual presentation is based on cultural conceptions and aesthetic conventions of what a machine sees. This is a now common trope of surveillance camera aesthetics: a framed interface with continuous live technical data. The bird's-eye view combined with the technical interface signal that we're meant to see this image in a specific way, that is, "as the machine." The difference between the machinic perspective and Cloud's player perspective is only evident because of the interface's aesthetics.

The shift to the camera's perspective shows how technical surveillance vision shapes Cloud's body into a target, a perception beyond Cloud's—and the player's—control. We can only watch as Cloud is targeted by surveillance cameras, which emphasizes his status as an outsider to this space. It's not yet a hostile vision (after Shinra reveals the truth about their covert surveillance, military drone perspectives show Cloud targeted with *red* technical interfaces) but rather presents a seemingly neutral account of Cloud's character. The neutrality comes from technical vision's "honest" representation of events, which Finn (2012) notes is

[2] In the beloved original game from 1997 that *Final Fantasy VII Remake* is a remake of, this happens once, but the guard who monitors the cameras is sleeping, allowing Cloud to pass unnoticed. In *Final Fantasy VII Remake*, the surveillance technology itself can track Cloud's movements and therefore doesn't rely on a human staying awake and alert.

becoming the new real; what was previously considered technical flaws are now conventions of tabloid style. Now, "real" is grainy, pixelated, underexposed, or containing the framed interface that we know from cameras. In other words, the image must visually explain its authenticity so that we know that we're watching real footage. Whatever Cloud does on hidden camera is true. In this way, the technical interface—or rather, the camera's perspective—becomes a constitutive part of Cloud's character.

A closer examination shows just how much of Shinra's power is linked to technological prowess and surveillance camera access. In using these cameras, Shinra's Head of Security Heidegger thinks he can see everything. Technology plus planning equals Heidegger playing god. The omniscient antagonist is a known feature of games, often coinciding, as for Heidegger, with surveillance camera access. This is seen in, for instance, *Portal*'s (Valve 2007) GLaDOS and *Manhunt*'s (Rockstar North 2003) The Director, with the difference that, unlike Heidegger, these villains announce their surveillance of the player character from the very beginning. Cloud and Avalanche, however, have no awareness of camera surveillance at this point in the game. Surveillance cameras by design keep us unaware of who or what or why. An assumed watcher, lurking beyond one's perception, evokes uncertainty. When surveillance cameras are essentially one-sided, the power to see resides with those who control the camera, and Heidegger is the one who controls the camera: its presence and its usage. Haraway (1988: 585; emphasis in the original) explains that vision "is *always* a question of the power to see," and *Final Fantasy VII Remake* presents the conditions for power and empowerment in a Foucauldian sense of domination, discipline, and biopower. In this way, empowerment and resisting or replacing power are the same thing because only one can dominate.

Yet for all his money and power, Heidegger can't see everything. The abovementioned scene certainly plays with the fantasy of a universal view, but Haraway (1988) reminds us that this is a "god trick." The idea of an objective and omniscient view from nowhere—of being raised to a point where you can see everything and nothing can see you—denies contextual factors and distances the subject from a body. It goes against the notion of situated knowledges. Indeed, the cameras, Heidegger's prosthetic eyes, are proven to have their limits. In one notable scene, Avalanche disrupts the technology that is watching them, effectively shutting down Heidegger's augmented vision. The blackout is caused by an explosion after an arduous fight with a Shinra robot and is unintentional on Avalanche's behalf. Still, it shields them temporarily from surveillance and offers a brief respite from the seemingly omniscient Heidegger.

Apart from this episode, surveillance is beyond Cloud's control. Going back to Lyon's (2018) question of how characters are invited to respond to surveillance situations, the actions that Cloud and Avalanche can take are either accidental or evasive. Both eventually play into Shinra's orchestration. Later in *Final Fantasy VII Remake*, security footage that shows Avalanche breaking into the Shinra headquarters is broadcast in front of Avalanche and the entire city. It turns out that Shinra has deliberately allowed Avalanche access to their headquarters to fuel their narrative that Avalanche is a terrorist group. Moreover, Shinra uses this as an excuse to take even more control. The security footage they now have of Avalanche's breaking and entering is unquestionable proof. As such, the carefully orchestrated scene depends on the legitimacy of video recordings. Heidegger himself acknowledges the theatricality of the situation with a nod to Roman satire when he declares to Avalanche that "to a people beset by chaos and uncertainty, we will offer the finest comfort: bread and circus." The surveillance situation is a diversion for the citizens of Midgar, a diversion that gives more power to Shinra. It certainly links power with its dire but playful surroundings.

The positioning of surveillance technology throughout the game shows that control is reserved for Shinra, and that surveillance is equated to subjugation (see Chandler 2014). While Cloud and Avalanche are in the "sophisticated" parts of Midgar, they're subjected to unannounced identity scans and video surveillance. One dominant strategy of coping with this ubiquitous surveillance is trying to hide. Such a strategy is only successful when the technology is disrupted as an effect of their destroying Shinra property. Paralleling this is the fact that the player character is never given the opportunity to interact with surveillance cameras. All visual presentations of camera feeds are presented in cutscenes, filmic sequences within the game. Thus, neither Cloud nor the player can change the course of events that Shinra's use of surveillance cameras

dictate. They can only play into the scripted event and watch as it unfolds again, in the truth-telling visuals of surveillance camera footage.

Summarizing, surveillance cameras in *Final Fantasy VII Remake* are fully realized spatial perspectives that influence how we understand the virtual environment. We always know from somewhere (Haraway 1988), and over the course of the game, this knowledge is several times situated in the machinic eyes of surveillance cameras. The cameras construct Cloud's body as a target, further framed by Heidegger's narrative of terrorism. Being unaware of this surveillance, Cloud and Avalanche merely play into Heidegger's orchestration. Throughout the game, players are presented with Cloud's, Heidegger's, and the surveillance camera's perspectives, but this well of perspectives doesn't change available actions for the player. It results in an experience of knowing and *not* doing—perhaps a novel feeling for players because in a medium famed for its user influence, disempowerment is rare.

Negotiating Visibility in *Watch Dogs: Legion*

As similar as the framing of *Final Fantasy VII Remake* (Square Enix 2020) and *Watch Dogs: Legion* (Ubisoft Toronto 2020) is, their representations of surveillance cameras are strikingly different. Incidentally, both games emphasize the consequences of corporate greed and injustice and the necessity to fight back, depict the surveilled lives of citizens in heavily surveilled urban environments, include player characters that want to operate away from the public eye, and frequently present embodied surveillance cameras. However, while *Final Fantasy VII Remake* never allows the player to control surveillance cameras, in *Watch Dogs: Legion,* surveillance cameras are very much part of the way the game plays. Player characters in *Watch Dogs: Legion* aren't pawns of surveillance in the same way that *Final Fantasy VII Remake*'s Cloud is; rather, they're means of exploring how power operates on both sides of the camera. Over the course of the game, player characters will hack into hundreds of surveillance cameras and use them for their own purposes. As such, *Watch Dogs: Legion* explicitly invites connecting the game experience to current surveillance politics through focusing on activism and hacking. The game is partaking in configuring a more bottom-up approach to surveillance because the player character utilizes the infrastructure already available to "watch the watchers." It's a kind of sousveillance: watching from below and as part of a group. As phrased in one of the diegetic podcasts that player characters can listen to while driving or walking: "They're watching us but we're watching them too."

In *Watch Dogs: Legion*, private corporations control a fictionalized modern-day London through its central Operating System (ctOS). The ctOS connects everything from traffic lights and security cameras to devices such as the Optik, an augmented reality optical device with a built-in artificial intelligence that functions as a web browser, a wallet, and personal identification. Thanks to the Optik and the ctOS, everyone in London is identified with name, profession, and salary, as well as their current whereabouts and actions. Further upgrades to this profiling system can also give information on a person's relationships and schedules, not unlike interconnected systems for profiling seen in place in the world today. It's mandatory for the people of London to wear an Optik. The player character is one of millions of citizens who are continuously under surveillance—although this surveillance is partly limited because the player character is also a member of the vigilante hacker group DedSec, who can to some extent bypass the implant's surveillance. Ultimately, DedSec's goal is to expose and overthrow the corrupt government. By hacking into the ctOS, DedSec shows both how powerful and how vulnerable the system is.

As members of DedSec, player characters in *Watch Dogs: Legion* often find themselves part of complex surveillance assemblages wherein they initiate and control most of the surveillance. Note that *Watch Dogs: Legion*'s player characters ("Operatives") differ from player to player because the game system randomly creates them based on a set of predefined profile traits. Later Operatives can be recruited freely from the citizens of London—essentially turning non-player characters into player characters based on demographic profiling. My first Operative was an elderly woman identified as Sally Fitzsimmons and profiled as a novelist and retired cryptographer. Sally and other Operatives use the city's surveillance cameras to gain control over other citizens by, e.g., finding criminal records or seeing what happens behind closed doors.

Sally can also use cameras as decoys by programming them to make noise to attract attention. Oftentimes, surveillance assemblages include both surveillance cameras and drones. One such example is hacking into a camera to find an aerial delivery drone, hijack it, make it fly to street level to pick the Operative up, fly the drone up to a roof, initiate a spider drone they carry with them, and control the spider drone into a very narrow entrance to gain access to classified information.

It's worth noting that *Watch Dogs: Legion* focuses more on portable cameras such as drones and less on stationary security cameras than its predecessors do (it's a stand-alone title in a franchise, much like the James Bond films, so there are several similarities to previous titles in the same series). This shifting focus could be seen as a contemporary trend that hearkens back to the metaphor of perspectival change that *Super Mario 64*'s Lakitu Bros introduced: from the static to the portable. However, stationary cameras are still important parts of the surveillance assemblage in *Watch Dogs: Legion*. In fact, security guards will alert someone if they see a drone entering prohibited space but not if the Operative is hacking a surveillance camera, because there's no identifiable alien body present. The security guards in *Watch Dogs: Legion*, like many people in the physical world, are habitualized to surveillance cameras in urban areas. For a player character, repurposing technology that is already present doesn't draw Big Brother's attention.

Interacting with the surveillance camera is a kind of prosthetic embodiment that involves several interrelated agents. Consider the following scenario: Sally is standing inside Scotland Yard's reception area. She uses her cellphone to hack into a surveillance camera behind the reception counter. Turning the camera slightly, she locates the button that temporarily disables the body scan's alarm system next to the counter so she can pass unnoticed. The diegetic assemblage of Sally, the cellphone, and the camera show how the "whos" are blurred. Using Haraway's (1988) concept of situated knowledges, we can acknowledge the assemblage while focusing on the "from wheres": the perspectives of the older white woman rebel standing in a London office lobby and the wall-mounted security camera in a heavily surveilled space.

Becoming the camera isn't, however, becoming invisible for Sally. Visually, the player's perspective moves to the surveillance camera's location instead of presenting Sally's cellphone as she would see it. In this new perspective, the camera (and by extension the player) can still see Sally—albeit pixelated, because DedSec has a hacked version of the ctOS. Thus, when Sally "is the camera," she is also still in the lobby, staring at her cellphone. Because of her hacker abilities, Sally is free from *identification* by technical surveillance but she isn't completely free from being seen. Dubrofsky and Magnet (2015) identify that, in the face of surveillance, there's a continuous trade-off between seeing and not seeing, between invisible bodies and hypervisible bodies. The assemblage shows how Sally isn't allowed to become oblivious to her own body; she isn't allowed not to have a body (Haraway 1988). Moreover, this insistence on a body ironically shows that the jump from Sally to the camera isn't into "a conquering gaze from nowhere" (Haraway 1988: 581) because it's also her. In this instance, Sally can't escape representation nor avoid being seen. In other words, having the power to make others visible doesn't necessarily relieve you from being seen. The camera is present regardless.

Hiding from mechanical eyes is an important strategy for DedSec, as for *Final Fantasy VII Remake*'s Avalanche, with the difference being that DedSec can actually hide most of the time. Sally and other Operatives use both nontechnical and technical ways of escaping identification. Every mission involves simple yet effective cloaking devices like a mask or a uniform. More advanced strategies include an augmented reality cloak that temporarily renders the Operative invisible or using the ctOS hack to become "illegible" for surveillance camera profiling. These instances of tricking vision aren't reserved for cutscenes but happen in the virtual environment where the player can control it. Thus, attempting to hide becomes a primary mechanic in the game.

Cyborg vision in games such as *Watch Dogs: Legion* shows how the camera as an agent is intrinsically interrelated with other agents in the assemblage. It also shows how this vision is never unmediated. There's perhaps a sense of universality in the surveillance camera. After all, it's fixed in the same place outside of (human) bodies for every playthrough. But the generated player characters show that even just within the

diegetic space, it's never the same vision. In Scotland Yard, the gaze is simultaneously that of Sally, the security camera, and whoever else might be watching the camera feed. Each unique agent constitutes a part of the vision. Going beyond the diegetic world of *Watch Dogs: Legion*, this parallels the relationship between player and game. As Andrejevic (2015: xvi) remarks, surveillance technologies provide "a suggestive metaphor for the fact that our gaze is never unmediated, innocent, or free of preconceptions, background knowledge, and information." Through the partial perspectives of cyborg vision, we see that this vision is not only changing and enhancing but also faulty, active, embodied, specific, limited, subjective; in other words, situated.

Hacking in *Watch Dogs: Legion* is a negotiation between different agents about who is allowed to watch. For the Operative, watching is power. As the Operative, I continuously look for and navigate around surveillance cameras; I think with cameras. Whitson and Simon (2014) explain that allowing players to act "as if" they're agents or subjects of surveillance gives the experience of watchfulness in addition to abstract meanings of watching. The player "literally," not just metaphorically, engages in focused watching because the surveillance camera both enacts and thematizes the human-nonhuman relations here (Whitson and Simon 2014: 31). Thus, Sally staring at her phone and becoming the surveillance camera in Scotland Yard parallels how the player experiences embodiment being distributed between bodies and perspectives. This effect also blurs the borders between the diegetic world and our physical world because the cameras don't neatly separate between diegetic and nondiegetic worlds, which fails "to situate viewers in a consistently and coherently designed spectating-position" (Denson 2020: 26).

However, to embody the surveillance camera is not only about acting through it but also being acted upon. We're prompted to engage with these cameras, and in turn, they control which actions are allowed and how to approach the game; how to play. Focusing on the camera's perspective in such a way can help hold us accountable to "what we learn how to see" (Haraway 1988: 583) because the diegetic camera interface limits and expands vision, enables and constrains information. Here are found traces of the concept of "seeing surveillantly" (Finn 2012). The concept builds on Sontag's (2008: 1) claim that "(i)n teaching us a new visual code, photographs alter and enlarge our notions of what is worth looking at and what we have a right to observe. They're a grammar and, even more importantly, an ethics of seeing." Phrased differently, the cameras influence us back. In *Watch Dogs: Legion*, using surveillance cameras is almost always beneficial to the player character's cause, but the surveillance camera design only highlights certain people, objects, paths—in short, not everything is important. You can only see and act on parts of information. As a result, what's worth looking at and what we have a right to observe are regulated by the presence of the surveillance camera.

The narrative and game mechanics of *Watch Dogs: Legion* allow players to reflect upon and experiment with surveillance in society, which has ramifications beyond the virtual environment. This invitation is especially evident in the diegetic podcasts. They raise current topics, such as historic and contemporary fascism, Nazism, harassment of immigrants, suspension of the checks and balances system, fake news, and several mentions of surveillance capitalism (Zuboff 2019). In fact, the in-game podcasts literally ask questions we see in our own news, such as "What is privacy in the digital world?" and "How can we tell when our national media has become state propaganda?" These questions are directed to the player as much as they're to the player character, emphasizing that we, like DedSec, should be skeptical about ubiquitous surveillance. In the words of *Watch Dogs: Legion*, the ubiquity of surveillance has a direct influence on the people living through it: "It's a much more peaceful society. It's just much less of a society." The sheer number of surveillance cameras in fictional London and their cooperation with other technologies not only opens a new space for play but also for considering the increasingly intertwined relationship we have with surveillance technology around us.

In the end, however, the empowerment of hacking into surveillance cameras complicates the critique the game raises. Corrupt governments and corporations are doing evil through these cameras, but the system is good if *you* use it. As in *Final Fantasy VII Remake,* the player character's perspective largely dictates the representation of surveillance agents but rarely, if ever, turns the magnifier back on themselves. In its desire

to empower players, *Watch Dogs: Legion*, like its predecessors, doesn't clearly prompt the player to stop and think about whether they *should* hack (see Huls 2014). The idea of the "good guys" doing bad things is briefly mentioned on two occasions but not elaborated. In one podcast episode, the hosts speculate that DedSec's hacked version of the artificial intelligence inside Optiks might be dangerous if left unchecked. Additionally, the primary villain raises and then quickly glosses over the tensional question of how many people had to die for DedSec to be where they are now. Private corporations are sarcastically compared to malevolent deities, but the Operative that uses the same infrastructure escapes critique. DedSec's power eventually becomes more than that of the villains in the game, and it would be terrifying if it were in less benevolent hands. In DedSec's management, however, everyone is safe. In other words, *Watch Dogs: Legion* says that panoptic systems are here to stay; we just need to make sure the right people are in control. There's no escaping surveillance, only controlling. Consequently, the embodied experience of surveilling in *Watch Dogs: Legion* simultaneously contests and reinforces surveillance culture.

Playing Surveillance, Playing Cameras

Traditionally, the vernacular use of play associated with games as something lighthearted seems to stand in juxtaposition with more dystopian aspects of surveillance society. Yet, as illustrated by surveillance scholars and game scholars alike, play repeatedly proves to be a serious business (Albrechtslund and Dubbeld 2005; Bogost 2007; Jørgensen 2014; Marx 1996). The forty-one games in this article are complex examples of surveillance as entertainment (Albrechtslund and Dubbeld 2005) that call into question the relationship between power and play, technological and human, and visibility and control. It's undoubtedly playful *and* serious to hide in the security room of the spaceship in *Among Us* (InnerSloth LLC 2018) and attempt to catch on camera which of your friends is the killer, or to carry portable surveillance cameras with you to always stay in their line of sight and avoid being tranquilized by the government in *Nothing to Hide* (Case 2014). These cameras are not only part of the aesthetics of the virtual environment: they are a condition by which the virtual environment exists.

Embodied surveillance cameras in digital games make the camera metaphor explicit as an aesthetic, narrative, and mechanical preoccupation. The narratives of *Final Fantasy VII Remake* and *Watch Dogs: Legion* emphasize the consequences of corporate greed and injustice and the necessity to fight back. In fact, both player characters are already rebelling from established groups against systemic control when the game begins. Avalanche and DedSec are seemingly at the margins because the ruling class targets and outlaws them. To not fight isn't an option. Our player character protagonists operate away from the public eye but are forced into the light by being framed for attacks and labeled as terrorists. Visual surveillance is proof. However, moving the focus from a narrative level to a mechanical one shows that the invitations to respond differ for Cloud and the Operator and that their responses are constructed around surveillance camera representations. Cloud can attempt to hide and disrupt; he doesn't have access to the technology itself, only taking evasive measures as its target. The Operator is given the opportunity to interact with and through the cameras, still subjected to the gaze they inflict on others. In both instances, to varying degrees, the player experiences thematized cyborg vision by embodying not only the player character but also the surveillance camera. This new space of play is within the carefully constructed interface of the surveillance camera.

Games can thematize cyborg vision, which shows not only how machinic transformation of vision allows for perceiving what normally would be beyond the capability of a human but also how it limits and controls action. Indeed, *Final Fantasy VII Remake*, *Watch Dogs: Legion*, and most of the other games discussed[3] show surveillance done by you as purely benevolent and even altruistic but surveillance done to you as oppressive—yet the technology stays the same. When an Operative has control of surveillance cameras, it's

[3] Out of the forty-one games, there are five games that challenge this representation. *Beholder* (Warm Lamp Games 2016), *Do Not Feed the Monkeys* (Fictiorama Studios 2018), *Orwell* (Osmotic 2016), and *République* (Camouflaj 2013) show how economic disparity and labor aspects of surveillance assemblages force player characters to engage in oppressive and intrusive camera surveillance, while *Observation* (No Code 2019) presents the camera as a kind of unreliable first-person narrator where we're unsure of "our" intentions.

presented as a helpful tool, whereas the sentiment takes a negative turn when they or Cloud is subjected to the gaze of the machine. The shift is in those who operate the surveillance camera and the power this control brings. However, as I have demonstrated, vision is constructed by several agents, including an often-silent agent: the camera. As surveillance technologies "propose new modalities of attention and watchfulness in our everyday lives" (Whitson and Simon 2014: 316) and contribute to partial ways "of organizing worlds" (Haraway 1988: 583), we should consider these cameras as parts of surveillance assemblages where each agent contributes to how we think and play with and through cameras.

This study of the game camera in general and diegetic surveillance cameras specifically draws attention to and problematizes the increasingly partial and embodied cyborg visions with which worlds are viewed. Such a pluralistic and situated vision between human and nonhuman agents will be increasingly relevant as we outsource more perceptual capabilities and agencies to the machines around us. Cyborg vision crosses the "border" between human and nonhuman and is a term that can help scholars explore human-technical surveillance assemblages within, between, and outside of the realm of games. Playing cyborg vision's embodied experiences of surveillance in games allows us to reflect on the way in which camera technologies are intertwined with everyday life, and the power dynamics that are present in these assemblages. The permeability of vision within these virtual environments is then mirrored in the intersection between virtual environment and physical world. Through these layers of cyborg vision, games allow power fantasies and their critique—the hiding, hacking, destroying, protecting, disrupting, escaping, subverting, investigating, commanding, complying, avoiding, and exploiting—to coexist within a space of play.

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References

3909 LLC. 2013. *Papers, Please*. Microsoft Windows.

Albrechtslund, Anders, and Lynsey Dubbeld. 2005. The Plays and Arts of Surveillance: Studying Surveillance as Entertainment. *Surveillance & Society* 3 (2): 216–221.

Andrejevic, Mark. 2015. Foreword. In *Feminist Surveillance Studies*, edited by Rachel E. Dubrofsky and Shoshana A. Magnet, ix–xviii. Durham, NC: Duke University Press.

Benjamin, Garfield. 2019. Playing at Control: Writing Surveillance in/for Gamified Society. *Surveillance & Society* 17 (5): 699–713.

Blizzard Entertainment. 2005. *World of Warcraft*. Microsoft Windows.

Bogard, William. 1996. *The Simulation of Surveillance: Hypercontrol in Telematic Societies*. Cambridge, UK: Cambridge University Press.

Bogost, Ian. 2007. *Persuasive Games: The Expressive Power of Videogames*. Cambridge, MA: MIT Press.

Boulter, Jonathan. 2015. *Parables of the Posthuman: Digital Realities, Gaming, and the Player Experience*. Detroit, MI: Wayne State University Press.

Camouflaj. 2013. *République*. GungHo Entertainment. Android.

Case, Nicky. 2014. *Nothing to Hide*. Microsoft Windows.

Chandler, David. 2014. Think the NSA Is Bad? Games Are Masters of Surveillance. Kill Screen, July 21. https://killscreen.com/previously/articles/think-nsa-bad-how-games-have-their-eyes-you/ [accessed January 5, 2021].

Christiansen, Steen. 2016. Uncanny Cameras and Network Subjects. In *Digital Horror: Haunted Technologies, Network Panic and the Found Footage Phenomenon*, edited by Linnie Blake and Xavier Aldana Reyes, 42–53. London: I.B.Tauris & Co.

Chunsoft, Spike. 2019. *AI: The Somnium Files*. Numskull Games. Microsoft Windows.

Cybulski, Alex Dean. 2014. Enclosures at Play: Surveillance in the Code and Culture of Videogames. *Surveillance & Society* 12 (3): 427–432.

Denson, Shane. 2020. *Discorrelated Images*. Durham, NC: Duke University Press.

Digital Pictures. 1992. *Night Trap*. Sega. Microsoft Windows.

Dubrofsky, Rachel E., and Shoshana A. Magnet. 2015. Feminist Surveillance Studies: Critical Interventions. In *Feminist Surveillance Studies*, edited by Rachel E. Dubrofsky and Shoshana A. Magnet, 1–20. Durham, NC: Duke University Press.

Fictiorama Studios. 2018. *Do Not Feed the Monkeys*. Alawar Premium. Microsoft Windows.

Finn, Jonathan. 2012. Seeing Surveillantly: Surveillance as Social Practice. In *Eyes Everywhere: The Global Growth of Camera Surveillance*, edited by Aaron Doyle, Randy Lippert, and David Lyon, 67–80. Abingdon, UK: Routledge.

Gad, Christopher, and Peter Lauritsen. 2009. Situated Surveillance: An Ethnographic Study of Fisheries Inspection in Denmark. *Surveillance & Society* 7 (1): 49–57.
Giant Bomb. N.d. Surveillance Camera. https://www.giantbomb.com/surveillance-camera/3055-898/ [accessed December 4, 2020].
Giddings, Seth. 2005. Playing With Non-Humans: Digital Games as Techno-Cultural Form. In *DiGRA '05: Proceedings of the 2005 DiGRA International Conference: Changing Views: Worlds in Play, Vancouver, Canada, June 16–20*. http://www.digra.org/wp-content/uploads/digital-library/06278.24323.pdf.
———. 2009. Events and Collusions: A Glossary for the Microethnography of Video Game Play. *Games and Culture* 4 (2): 144–157.
Haraway, Donna J. 1988. Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. *Feminist Studies* 14 (3): 575–599.
———. 1991. *Simians, Cyborgs, and Women: The Reinvention of Nature*. London: Free Association Books.
Hayles, N. Katherine. 2016. Cognitive Assemblages: Technical Agency and Human Interactions. *Critical Inquiry* 43 (1): 32–55.
———. 2017. *Unthought: The Power of the Cognitive Nonconscious*. Chicago, IL: University of Chicago Press.
Huls, Alexander. 2014. So, What Did Watch Dogs Actually Have to Say about Surveillance Culture? Kill Screen, June 25. https://killscreen.com/previously/articles/so-what-did-watch-dogs-actually-have-say-about-surveillance-culture/ [accessed December 7, 2020].
InnerSloth LLC. 2018. *Among Us*. Microsoft Windows.
Jørgensen, Kristine. 2012. Between the Game System and the Fictional World: A Study of Computer Game Interfaces. *Games and Culture* 7 (2): 142–163.
———. 2014. Devil's Plaything: On the Boundary between Playful and Serious. In *DiGRA Nordic '14: Proceedings of the 2014 International DiGRA Nordic Conference 11*, *Visby, Sweden, May 29–30*. http://www.digra.org/digital-library/publications/devils-plaything-on-the-boundary-between-playful-and-serious/.
Juul, Jesper. 2003. The Game, the Player, the World: Looking for a Heart of Gameness. In *Level Up: Digital Games Research Conference Proceedings*, *Utrecht, The Netherlands, November 4–6*, edited by Marinka Copier and Joost Raessens, 30–45. Utrecht, NL: Utrecht University.
———. 2005. *Half-Real: Video Games between Real Rules and Fictional Worlds*. Cambridge, MA: The MIT Press.
Keogh, Brendan. 2016. Hackers and Cyborgs: Binary Domain and Two Formative Videogame Technicities. *Transactions of the Digital Games Research Association* 2 (3). http://todigra.org/index.php/todigra/article/view/58.
Kerr, Aphra, Stefano De Paoli, and Max Keatinge. 2014. Surveillant Assemblages of Governance in Massively Multiplayer Online Games: A Comparative Analysis. *Surveillance & Society* 12 (3): 320–336.
Koskela, Hille, and Liisa Mäkinen. 2015. Ludic Encounters – Understanding Surveillance through Game Metaphors. *Information, Communication & Society* 19 (11): 1523–1538.
Krichane, Selim. 2021. When Seeing Is Playing: The History of the Videogame Camera. *Game Studies* 21 (2). http://gamestudies.org/2102/articles/krichane.
Lyon, David. 2018. *The Culture of Surveillance*. Cambridge, UK: Polity Press.
Mäkinen, Liisa. 2017. Ludic Surveillance: Examining Mundane Surveillance Practices at the Interface of Control and Play. PhD dissertation, University of Helsinki. http://urn.fi/URN:ISBN:978-951-51-2590-3.
Marx, Gary T. 1996. Electric Eye in the Sky: Some Reflections on the New Surveillance and Popular Culture. In *Computers, Surveillance and Privacy*, edited by David Lyon and Elia Zureik, 193–223. Minneapolis, MN: University of Minnesota Press.
Molleindustria. 2012. *Unmanned*. Microsoft Windows.
Morrissette, Jess. 2020. About This Project. The Video Game Soda Machine Project. http://vgsmproject.com/about/ [accessed July 7, 2020].
Nintendo. 1996. *Super Mario 64*. Nintendo 64.
No Code. 2019. *Observation*. Devolver Digital. PlayStation 4.
Orwell, George. 2013. *Nineteen Eighty-Four*. London: Penguin Books.
Osmotic. 2016. *Orwell*. Fellow Traveller. Microsoft Windows.
Philips POV Entertainment. 1993. *Voyeur*. Philips Interactive. Microsoft Windows.
Rettberg, Jill Walker, Marianne Gunderson, Linda Kronman, Ragnhild Solberg, and Linn Heidi Stokkedal. 2019. Mapping Cultural Representations of Machine Vision: Developing Methods to Analyse Games, Art and Narratives. In *Proceedings of the 30th ACM Conference on Hypertext and Social Media*, *Hof, Germany, September 17–20*, 97–101. Hof, Germany: ACM Press.
Rettberg, Jill Walker, Linda Kronman, Ragnhild Solberg, Marianne Gunderson, Stein Magne Bjørklund, Linn Heidi Stokkedal, and Kurdin Jacob. 2021. Machine Vision in Art, Games and Narratives. https://machine-vision.no/ [accessed January 11, 2021].
Rival Games. 2019. *Alien: Blackout*. D3Publisher Inc. Android.
Rockstar North. 2003. *Manhunt*. Rockstar Games. Microsoft Windows.
Rocksteady Studios. 2011. *Batman: Arkham City*. Warner Bros. Interactive Entertainment. Microsoft Windows.
Sontag, Susan. 2008. *On Photography*. London: Penguin Classics.
Sony Computer Entertainment Inc. 2002. *Surveillance Kanshisha*. PlayStation 2.
Sony Computer Entertainment Japan. 2003. *Lifeline*. PlayStation 2.
Square Enix. 2020. *Final Fantasy VII Remake*. PlayStation 4.
Taylor, Nicholas. 2016. Play to the Camera: Video Ethnography, Spectatorship, and e-Sports. *Convergence: The International Journal of Research into New Media Technologies* 22 (2): 115–130.
Taylor, T.L. 2009. The Assemblage of Play. *Games and Culture* 4 (4): 331–339.
Thon, Jan-Noël. 2009. Perspective in Contemporary Computer Games. In *Point of View, Perspective, and Focalization. Modeling Mediation in Narration*, edited by Peter Hühn, Wolf Schmid, and Jörg Schönert, 279–299. Berlin, DE: de Gruyter.
Ubisoft Montreal. 2016. *WATCH_DOGS 2*. Ubisoft. PlayStation 4.

Ubisoft Toronto. 2020. *Watch Dogs: Legion*. Ubisoft. PlayStation 4.
Valve. 2007. *Portal*. Microsoft Windows.
Vishnevetsky, Ignaty, Matt Gerardi, A.A. Dowd, and John Teti. 2016. Super Mario 64 Introduced the Camera as a Friend and Foe in Video Games. AV Club, August 10. https://games.avclub.com/super-mario-64-introduced-the-camera-as-a-friend-and-fo-1798250469 [accessed December 2, 2021].
Wang, Victoria, Kevin Haines, and John V. Tucker. 2011. Deviance and Control in Communities with Perfect Surveillance – The Case of Second Life. *Surveillance & Society* 9 (1/2): 31–46.
Warm Lamp Games. 2016. *Beholder*. Alawar Premium. Microsoft Windows.
Whitson, Jennifer R. 2015. Foucault's Fitbit: Governance and Gamification. In *The Gameful World: Approaches, Issues, Applications*, edited by Steffen P. Walz and Sebastian Deterding, 339–358. Cambridge, MA: MIT Press.
Whitson, Jennifer R., and Bart Simon. 2014. Game Studies Meets Surveillance Studies at the Edge of Digital Culture: An Introduction to a Special Issue on Surveillance, Games and Play. *Surveillance & Society* 12 (3): 309–319.
Zuboff, Shoshana. 2019. *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power*. London: Profile Books.

Article IV

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