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The impact of integrating Artificial Intelligence into the video games industry.

A case study.

Nele Fee Bonn

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THE IMPACT OF INTEGRATING ARTIFICIAL INTELLIGENCE INTO THE VIDEO GAMES INDUSTRY: A CASE STUDY.

Nele Fee Bonn

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Supervisor: Anders Hedman
Examiner: Haibo Li
School of Electrical Engineering and Computer Science

Inverkan av att integrera artificiell intelligens i spelindustrin. En fallstudie.

Nele Fee Bonn. Neleb@kth.se Fatburs Brunnsgata 32, lgn 1202 118 28 Stockholm, Sweden
KTH Royal Institute of Technology, School of Electrical Engineering and Computer Science, Stockholm, Sweden, SE 100 44.

THE IMPACT OF INTEGRATING ARTIFICIAL INTELLIGENCE INTO THE VIDEO GAMES INDUSTRY

NELE BONN

ABSTRACT

Artificial Intelligence (AI) possesses the potential to profoundly reshape numerous established industries, including the video games industry. This transformative potential arises from algorithms that operate not only on a technical level, but also on a creative and artistic level, particularly with the advent of generative AI.

To elucidate the current role of AI within the video game industry and identify potential trajectories for development, structured interviews were conducted with programmers, AI experts, and video game professionals. Moreover, the study aimed to discern the areas in which generative AI will have the most significant impact. The primary findings indicate that AI should function as an assistant, offering suggestions rather than making decisions. Furthermore, AI facilitates increased diversity and accessibility within the industry through enhanced representation. Urgent discussions regarding the protection of artists and the ethical implications of these advancements are crucial for timely legislation development.

The study also revealed that AI currently assumes a supportive role, augmenting human labor efficiency. It is employed for tasks such as balancing gameplay, matchmaking, debugging, anti-cheat mechanisms, and non-player character (NPC) dialogue. Human input remains indispensable, particularly in the creative domain and quality assurance processes.

Lastly, the report underscores the opportunities and challenges presented by these technical advancements and proposes potential solutions. The findings contribute to a comprehensive comprehension of the implications of AI and generative AI within the industry and offer recommendations for their responsible and ethical utilization.

Key words: Artificial intelligence, Machine Learning, Generative AI, Video Games, Gaming

SAMMANFATTNING

Artificiell intelligens (AI) har potentialen att på ett djupgående sätt omforma flera etablerade branscher, inklusive spelindustrin. Denna transformerande potential uppstår från algoritmer som inte bara fungerar på en teknisk nivå, utan även på en kreativ och konstnärlig nivå, särskilt med framväxten av generativ AI.

För att belysa den nuvarande rollen för AI inom spelindustrin och identifiera potentiella utvecklingsriktningar genomfördes strukturerade intervjuer med programmerare, AI-experter och spelbranschens yrkesverksamma. Dessutom syftade studien till att fastställa de områden där generativ AI kommer att ha störst påverkan. De primära resultaten indikerar att AI bör fungera som en assistent och erbjuda förslag istället för att fatta beslut. Dessutom underlättar AI ökad mångfald och tillgänglighet inom branschen genom förbättrad representation. Brådskande diskussioner om skyddet av konstnärer och de etiska konsekvenserna av dessa framsteg är avgörande för en tidig lagstiftningsutveckling.

Studien visade också att AI för närvarande antar en stödjande roll genom att öka effektiviteten hos mänskligt arbete. Den används för uppgifter som att balansera gameplay, matchmaking, felsökning, fuskförebyggande mekanismer och dialog för icke-spelarkaraktärer (NPC). Mänsklig input förblir oumbärlig, särskilt inom den kreativa domänen och kvalitetssäkringsprocesser.

Slutligen understryker rapporten de möjligheter och utmaningar som dessa tekniska framsteg medför och föreslår potentiella lösningar. Resultaten bidrar till en omfattande förståelse av konsekvenserna av AI och generativ AI inom branschen och erbjuder rekommendationer för deras ansvarsfulla och etiska användning.

Nyckelord: Artificiell intelligens, Machine Learning, Generativ AI, TV-spel, Gaming

WORD LIST

AAA – high-budget, high-profile “blockbuster” games

AR – Augmented Reality

ANN – Artificial Neural Networks

CNN – Convolutional Neural Networks

CPU – Central Processing Unit

DDA – Dynamic Difficulty Adjustment

DL – Deep Learning

GAN – Generative Adversarial Networks

GPT – Generative Pre-trained Transformer

GPU – Graphic Processing Unit

ML – Machine Learning

MMO – Massively Multiplayer Online Game

NN – Neural Networks

PCG – Procedural Content Generation

POC – Person(s) of Colour

PTS – Procedural Texture Synthesis

RPG – Role Play Game

VR – Virtual Reality

1 INTRODUCTION

The field of machine learning and artificial intelligence is rapidly evolving and has become ubiquitous in everyday life (IQ Motion, 2021). In recent years, there has been a significant increase in the use of AI across various industries, and it is expected to impact virtually every industry in the future (Gent, 2020). Platforms such as DALL-E, Midjourney, and Stable Diffusion, which utilize generative AI, have sparked a heated debate about AI art and its ability to learn from other artworks, causing some artists to express dissatisfaction (Roose, 2022). The introduction of ChatGPT in November 2022 has generated considerable interest, with 19.53 million organic searches on Google alone (Bahrenholtz, 2023), driving advances in the industry, including Google's ChatGPT Twin, "Bard," (Pichai, 2023) and Microsoft's "Bing" (Mehdi, 2023). In a 2017 interview, Ng referred to Artificial Intelligence as the new "electricity" and emphasized the importance of centering human needs, interests, and values in all future AI developments (Bond et al., 2019).

The video game industry, in particular, offers numerous opportunities for the development of artificial intelligence, from game development and distribution to player immersion and interaction (Skinner & Walmsley, 2019), which have become increasingly significant (Wang, 2022). Many top AAA titles from major studios already use generative AI to create environments, such as No Man's Sky and Microsoft's Flight Simulator, which are based on real environments. Ubisoft also uses AI to balance games and identify bugs to enhance the overall user experience (Wodecki & Moss, 2021). This paper will explore the various opportunities that AI offers the video game industry in the future.

2 SIGNIFICANCE

According to Parreno (2022), the video game sector is currently the largest in the entertainment industry, surpassing movies and music combined (BBC, 2019). In 2022, the industry generated approximately 184.4 billion US dollars in revenue (Wijman, 2022), experiencing a global growth rate of 39% during the pandemic lockdown (Kucher, 2021). Given the sector's dependence on technical advancements (Telefonica, 2022), there is a lack of clarity on the extent to which generative AI will impact the industry in the next decade. While expectations are high, industry developers at Ubisoft note that it is not a reliable predictor of what will actually be implemented (Wodecki & Moss, 2021). This research aims to address this gap by exploring the implications of generative AI in video games, with the goal of assisting gaming and technology companies in making informed decisions.

3 LIMITATIONS

This research will focus solely on the areas outlined above, taking a Westernized perspective and primarily examining developed countries and firms. The participants for this study were all in their mid-twenties up to their mid-thirties, so interviewing a much younger or older audience will require future research.

4 RESEARCH QUESTIONS

MAIN QUESTION

Could the use of generative AI in video games lead to the creation of new and unique gaming experiences that are not possible with traditional pre-written games?

SUB QUESTION 1

Could the use of generative AI in video games lead to the creation of more diverse and inclusive gaming experiences and how does it impact player engagement, enjoyment, and performance?

SUB QUESTION 2

What are the challenges that game developers face when creating personalized video games, and how can these challenges be overcome?

SUB QUESTION 3

What are the ethical implications of using AI-personalization in video games, and how can these implications be addressed?

5 HYPOTHESIS

The hypothesis of this paper posits that the adoption of generative AI technology in the video game industry will have a substantial influence on various aspects of the gaming experience, particularly with regards to player engagement and interactivity. Additionally, it suggests that the incorporation of AI into the industry will have wide-ranging implications across different stages of game development, from the initial design and development processes to the publishing and revenue-generation phases. Given the growing pervasiveness of AI across industries, the hypothesis implies that generative AI will have a significant and transformative effect on the video game industry in the coming years.

6 TECHNICAL BACKGROUND

ARTIFICIAL INTELLIGENCE AND GENERATIVE AI

Artificial Intelligence (AI) was first introduced by Alan Turing's in his Turing Test with his principles in the 1950s and concluded by McCarthy (Hodges, 2009). Researchers widely agree with this view (Smith, McGuire, Huang, & Yang, 2006). Most definitions of AI share common aspects: the computer system can demonstrate abilities typical of human beings, such as learning and self-improvement, decision-making, language use, problem-solving, and judgment creation (McCarthy, 1956; Garbuio & Lin, 2019; Mishra & Tripathi, 2021; Taddy, 2010; Zhang & Lu, 2021). In addition, AI can mimic human thought processes without human intervention (Skinner & Walmsley, 2019). Supervised and unsupervised learning are used in game development. Supervised learning involves using labeled training data to teach the system to learn from output control by the supervisor. Unsupervised learning distributes data into categories based on the developer's objectives (Kotsiantis, 2007; Mohammad et al., 2017).

The first AI introduced in a video game setting was the Pong AI NPC. It allowed players to play not just against a human player but also against the machine. Since then, AI in video games has evolved, with Deep Blue beating the chess grandmaster in 1997, and AlphaGo defeating the Go champion in 2016 (Skinner & Walmsley, 2019). The use of AI in video games has just begun, and it is believed to have a significant impact on the industry (Yannakakis & Togelius, 2018).

Generative AI, encompassed within the domain of machine learning, primarily focuses on the generation of novel content spanning diverse modalities such as audio, code, images, text, simulations, and videos, even extending to entire virtual worlds (McKinsey, 2023). This innovative approach revolutionizes content creation by endowing AI models with the ability to acquire knowledge from input data, allowing them to discern underlying structures and patterns. Subsequently, these models can generate new data that exhibits similar characteristics to the information on which they were trained, facilitated by neural network machine learning techniques.

ChatGPT (Chat-*generative-pretrained-transformer)* represents a significant advancement in language modeling, developed by OpenAI. It stands as a preeminent exemplar within the domain of generative artificial intelligence, and receiving considerable media interest. Through extensive training on a vast amount of online textual data, this model has been imbued with the capacity to generate contextually coherent and adequate responses. ChatGPT excels in various natural language processing tasks, encompassing question-answering, conversational interactions, translations, content generation, and information retrieval (OpenAI, 2023).

Especially in videogame development, particularly with regard to programming applications, the utilization of ChatGPT proves to be highly advantageous. When integrated into the process of creating actual games, this advanced language model facilitates the coding aspect of game development, a fundamental and time-consuming element that often demands years for programmers and developers to grasp, learn, and master. In recent times, a growing trend has emerged wherein videogames are released in a buggy or unfinished state, and making day-one patches become of necessity and continuous updates to rectify inherent flaws and shortcomings (Toledo, 2022).

By harnessing the capabilities of ChatGPT, the coding process in videogame development could be notably expedited, streamlined, and enhanced. The model can be deployed to undertake complex tasks that conventionally consume a substantial amount of developers' time. Moreover, ChatGPT serves as an invaluable tool for scrutinizing the final code, proficiently identifying and rectifying errors, thereby potentially reducing the occurrence of bugs, glitches, and other software-related issues. The integration of ChatGPT in videogame development holds the promise of increased efficiency and higher quality outcomes in the domain of coding.

DEEP LEARNING

Utilizing AI in video game development involves a crucial aspect known as deep learning (DL). As highlighted by Koch (2016), the integration of reinforced and supervised learning, alongside deep learning and neural networks, possesses the potential to enable the simultaneous playing of "hundreds of thousands of games against itself simultaneously." This approach is particularly cost-effective and time-efficient, as opposed to developing and testing prototypes individually (Togelius, 2016). Furthermore, as Dhar (2015) indicates, the next step in deep learning is to simulate human-like decision-making by emulating "common sense." Therefore, AI and DL testing offer a promising avenue for advancing the video game industry.

MACHINE LEARNING & NEURAL NETWORKS

Machine learning (ML) is a subfield of artificial intelligence that enables systems to act and react without explicit programming, relying on statistical models and algorithms instead. Deep learning, on the other hand, involves the use of artificial neural networks (ANN) to teach systems to think in a manner that emulates the layered structure and functioning of neurons in the human brain (Park & Lek, 2016; Gurney, 1997). In the realm of video games, supervised and unsupervised learning methods are frequently employed (Mohammad et al, 2017).

Convolutional neural networks (CNNs), along with generative adversarial networks (GANs) and procedural content generation (PCG), have become a popular tool in deep learning for video game systems due to their ability to learn from visual stimuli, such as the position of pixels on the screen (Dajose, 2021). Research has also shown that neural networks can be utilized in a multitude of ways in computer games, including the control of individual or multiple agents, or multiple neural networks controlling a single agent at once. These agents can be a part of the game environment, non-playable characters (NPCs), or game mechanics, detecting and acting upon the player's desired actions (Qualls & Russomanno, 2009).

SYNTHETIC MEDIA & PROCEDURAL GENERATION (GAN, PCG)

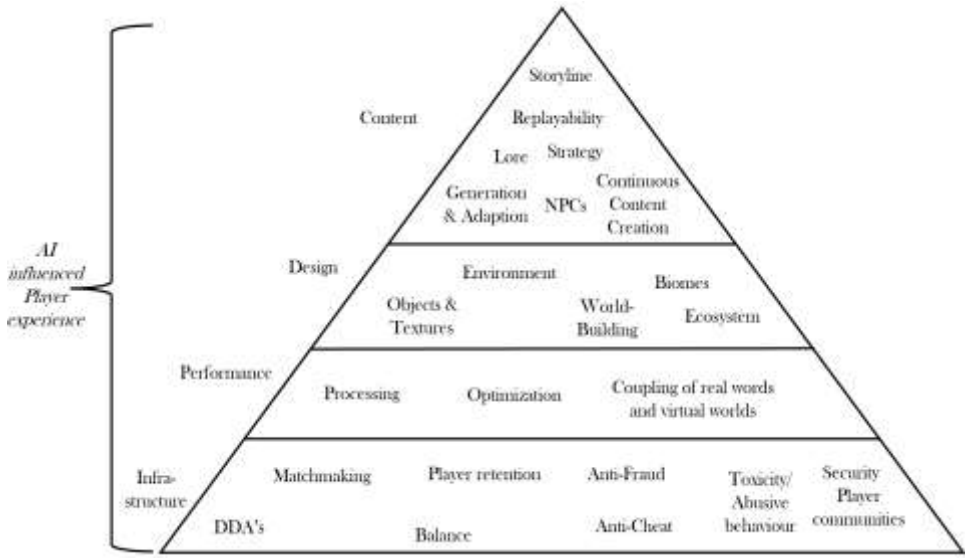
Synthetic Media and Procedural Generation, such as Generative Adversarial Networks (GAN) and Procedural Content Generation (PCG), have gained immense popularity in recent years. Synthetic media refers to media that is generated, manipulated, or modified by algorithms, which include text, image, speech, and music synthesis, mostly facilitated by GANs. The rise of deepfake content has further increased the popularity of GANs, which are transforming the way media is created, licensed, owned, and verified (Babu, 2020). GANs are a type of system that is trained on specific data, such as images, to create similar data sets with realistic characteristics, aiming to appear authentic to the observer (Brownlee, 2019). GANs have been applied in fashion, art, music, interactive media, astronomy, and videogame modding, aiding in scaling and rescaling textures and objects (Tang et al., 2018; Vincent, 2019).

PCG, on the other hand, generates data algorithmically rather than manually, and is primarily used in computer graphics, such as creating varying textures and entire 3D models (Shaker et al., 2016). It is mostly based on human-created models and assets, and is applied in videogames to provide a less predictable environment with a higher chance of player retention and replayability (Togelius, 2016). It is commonly used in roguelikes, RPGs, MMORPGs, open-world and survival games, to create environmental elements such as universes, biomes, scenery, loot systems, guns and equipment, as well as quests (Kuo, 2012). Procedural texture synthesis is a subcategory of PCG, which aids game developers by creating a large amount of high-quality dynamic content at a lower cost than traditional methods, and helps avoid repetition by learning specific patterns and creating new variations as output (Fadaeddini et al., 2015).

Procedural Generation, including both GANs and PCG, allows for game development and creation through algorithms instead of manual creation, minimizing the need for repetitive manual tasks, while being faster and more

efficient when creating diverse game worlds filled with a vast ecosystem, NPCs, and potential storylines for players to discover (Riedl & Zook, Skinner & Walmsley, 2019). It has the potential to enhance replayability and player retention by creating a sense of discovery and exploration through unique, personalized, and unpredictable content. Additionally, difficulty can be dynamically adjusted depending on the player's skill level. Procedural Generation can be an effective tool for game creation to enhance the overall gameplay experience, design, retention, and replayability while reducing time and cost (Togelius, 2016; Skinner & Walmsley, 2019).

AREAS OF APPLIED AI ACCORDING TO RIEDL & ZOOK



(Independently designed overview of the areas of improvement according to Riedl & Zook)

Riedl and Zook identify a range of areas in game development that can benefit from AI, as depicted in the accompanying diagram. Notably, AI can have a significant impact on level design (Irfan, 2019 et al), which encompasses all aspects of the game environment that players encounter as they progress, as well as NPCs (Cenkner et al., 2011), which includes character creation, dialogues, dynamic storylines (Dhar, 2015), behavior, and reactions to the player, as well as music and sound in general (Plut & Pasquier, 2019). Additionally, AI can facilitate the coupling of virtual and physical worlds (Riedl & Zook) through novel input sensor information from devices that have already been explored in bodily motion data, sound, GPS location, layouts, brain activity, and output data such as dual-screen experiences, 3D displays, projection technology, and augmented technology.

Steve Nouri recently presented OpusAIInc (2023), which enables the creation of an entire game level, including interactive items, NPCs, and more, using only written text. This technology may make game programming more accessible to individuals with limited or no programming experience by acting as a translator between written language and the underlying code.

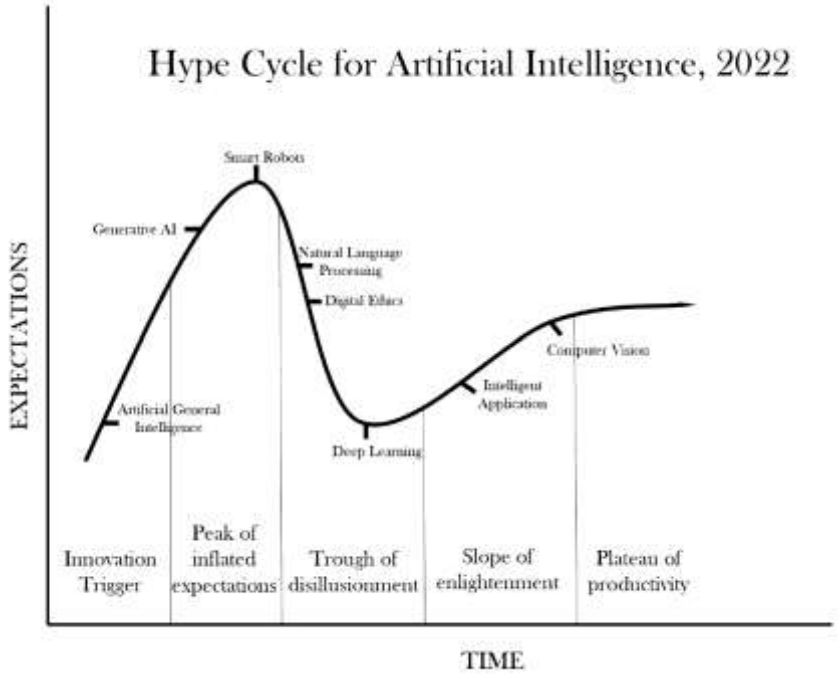
All of these categories have an impact on the overall player experience and contribute to providing an optimal experience for players to remain entertained and engaged in the game. These categories can be divided into four categories: design, content, infrastructure, and performance, although some may fall into multiple categories. The authors further categorize Game AI into three areas: the role of an actor mediating between the game and the player, the role of the designer mediating between the design and the system comprising the game and the player, and the role of the producer mediating between producers and the overarching systems connecting users, designers, and games.

AI has already been applied to a variety of games in numerous studios. For instance, 2K games is using synthetic textures and weapon design for Borderlands 2, while Hello Games' No Man′s Sky employs unique biomes and environments, and Microsoft′s Flight Simulator utilizes artificial environmental design. Ubisoft applies AI for matchmaking and balancing in games such as Rainbow Six Siege, game design and content generation in Watch Dogs

2, self-driving cars, and reducing negative player behavior overall (Kuo, 2012; Maguid and Jacquier, 2018; Morin, 2016; Reynolds, 2021). Recently, Ubisoft has employed AI for NPC dialogues with the aim of creating "individually interesting and realistic" characters with less manual work (Malik, 2023). The AI, called Ghostwriter, is not intended to replace game writers but rather to alleviate repetitive and labor-intensive tasks, allowing writers to focus on narrative development and immersion.

CHALLENGES AND LIMITATIONS

The challenges that arise during the application and implementation of novel technologies can prove to be pivotal to their future success, particularly when initial expectations exceed practical feasibility. This phenomenon is exemplified by the Garner-Hype-Cycle (Gartner, 2022), wherein the peak of expectations for a technology often precedes a period of adjustment and adaptation, located within the transitional phase between the Slope of Enlightenment and the Plateau of Productivity. The current cycle for Artificial Intelligence (AI) indicates that it has already surpassed its peak of expectations and is now poised to enter this transitional phase. Notably, this is further amplified by the recent surge of interest following ChatGPT's introduction to the broader market in late 2022.



(Graphic rebuilt and simplified according to Gartner.com, 2022)

When discussing generative AI, one significant challenge is the ongoing debate regarding whether artists should be concerned about their job security, and how AI should be permitted to learn from images to recreate them in a novel way. Additionally, questions arise as to whether artists should be compensated and how to address issues of plagiarism (Epstein et al., 2020; Beyer, 2022). Such ethical concerns could lead to a broader discussion about whether video games qualify as works of art and how a compensation framework might operate.

Another challenge is the discrepancy that most artworks experience when being displaced or influenced by computer-generated art. There is a tension between the importance of artistic enjoyment and its purpose (Leary, 2020). Art can serve as a distraction from the struggles of daily life, enable individuals to connect with others who appreciate the piece of art, and provide a means of self-expression. However, removing the deeper, human-influenced meaning of art could undermine these connections.

Furthermore, the data used by AI is not immune to human error, and learning from it reflects human biases that persist in society when making decisions (Hao, 2019). This bias can be directed against women and people of color, as seen in Amazon's AI (Dastin, 2018) and other instances (Hao, 2019). Consequently, there is an urgent need for trust in technological and technical systems (Albinson et al., 2019).

Togelius (2016) observes that when games become too vast and endless, players may find them tedious and lacking in direction. For instance, No Man's Sky (Chick, 2016) lacked a clear direction and struggled to maintain players' interest. Finding a balance between providing sufficient challenges and enjoyable content for players while also exploiting the vast potential of generative AI will require making deliberate artistic choices.

Another consideration is the human factor, particularly the tendency of players to "break" games (Togelius, 2016), and the need to develop new measures to address toxicity and abusive behavior among players, which AI may not be equipped to address effectively.

As graphics become more advanced, there is a need to keep pace with CPU power while also providing sufficient resources for AI development, which may necessitate a shift towards more powerful GPUs (Fairclough et al., 2001; Nareyek, 2004). Moreover, training an AI to mimic human-like "common-sense" requires a massive amount of data, which may limit the extent to which deep learning algorithms can operate effectively (IBM, 2022).

DISABILITY AND INCLUSION

Artificial intelligence (AI) is already being utilized to assist individuals with disabilities in overcoming everyday challenges. One example is the use of AI-powered voice-assisted technologies, which leverage speech recognition, speech-to-text, and text-to-speech technologies to enable individuals with hearing or speech impairments to communicate more effectively (Smartclick, 2022). AI-powered image recognition is also being used in applications such as self-driving cars, which have the potential to greatly enhance the mobility of individuals with physical disabilities.

In addition to these applications, mainstream video game companies have made significant strides in enhancing accessibility for individuals with disabilities. For instance, game versions have been tweaked to address issues such as colour blindness, and co-player options have been introduced to help players navigate difficult situations (Shin, 2022). Microsoft's Xbox has even developed specialized hardware, the Xbox Adaptive Controller, which caters to the needs of individuals with disabilities. Today's video games offer a wide range of customizable options and assistive modes, empowering players with disabilities to fully enjoy the gaming experience.

7 METHODOLOGY

LITERATURE REVIEW

A literature was conducted as part of the research in order to dive deeper into definitions, specifications, the context of this study, to connect these parts with one another and take a closer look at the methods already used and applied in the industry. It serves to review and explore the profound implications of Artificial Intelligence (AI) and Generative AI in video game development, emphasizing the potential impact on game design, content creation, and player experiences. It traces AI's historical progression from Alan Turing's Turing Test to recent breakthroughs like Deep Blue and AlphaGo, showcasing its capacity to revolutionize the gaming industry.

Generative AI, a subset of machine learning, emerges as a powerful tool for generating novel content across various modalities, with ChatGPT serving as a notable exemplar capable of contextually coherent responses. Integration of ChatGPT in game development shows promise for streamlining the coding process, identifying errors, and improving coding efficiency, elevating overall game quality.

Deep learning and neural networks play a pivotal role in AI-based game development, enabling machine learning methods, including Convolutional Neural Networks and Generative Adversarial Networks, to learn from visual stimuli and create diverse game worlds through procedural content generation.

Synthetic Media and Procedural Generation offer exciting possibilities in creating dynamic, high-quality game content while reducing costs. AI's potential in level design, NPC interactions, music, and coupling virtual and physical worlds enhances player engagement and immersion.

However, challenges and ethical concerns surround AI implementation. Debates arise regarding artists' job security, plagiarism, and the displacement of human artistry by AI-generated content. AI biases and ethical considerations warrant careful attention to ensure fair representation and inclusivity.

Moreover, striking a balance between generative AI's vastness and players' needs is essential to avoid overwhelming and tedious gaming experiences. Addressing player toxicity and considering human factors in game design remain challenges AI may not fully address.

Notably, AI presents opportunities to enhance accessibility and inclusivity for players with disabilities. AI-powered voice-assisted technologies and adaptive controllers enable players to fully enjoy the gaming experience.

In conclusion, AI's rapid advancements hold great potential in reshaping video game development. As AI becomes increasingly integrated, addressing ethical concerns, prioritizing inclusivity, and striking a harmonious balance with human creativity will be pivotal in harnessing AI's transformative power to create more immersive, engaging, and accessible gaming experiences.

CASE STUDY

A case study of interviews with industry experts has been performed to collect data from various parts of the industry. The study's empirical data was collected in accordance with Eisenhardt and Graebner's guidelines (2007) through a case study with structured interviews. This was done, to get an even more in-depth understanding of the industry and how AI finds its use-cases in video games. The interview questions were informed by the aforementioned technical background and administered both in-person and remotely via video conference. All interviews lasted <60 minutes and gave all professionals the chance to go as in-depth into their topic as possible, as well as mentioning any interesting topics they found important to mention. Industry experts were purposefully selected based on their connection to and extensive knowledge of the video game industry or AI, and were either contacted through social media or through the professional background of being a student at KTH or from the video games industry. These selection criteria ensured the high quality of the study. Participants were recruited from a variety of European countries (Sweden, Germany, UK, Denmark, Spain, and Italy) and South America (Brazil).

A case study was chosen for this research because it allowed enough room to dive deep into the topics of artificial intelligence and videogames and connect them with each other. The professionals were allowed to voice their thoughts and talk about experiences they have had working or studying on a project, as well as their opinion on how the industry has been changing and developing and what implications generative AI might bring. Spontaneous follow-up questions were asked depending on the topic or the comment, with the intention for the expert to dive deeper and elaborate on their opinions and experiences.

The participants were split into three groups: Programmers, AI experts, and video game experts. All had to have knowledge about both Artificial Intelligence and Video Games in order to participate in the study.

Questions for the interviews

TOPIC	QUESTION	KNOWLEDGE TO GAIN

Introduction of experiment	Explain the experiment	Consent
	Ask if it is okay to record the interview	
Experts	Who are you and what is your relationship to the video games/tech industry and AI?	Experts & areas of expertise
Generative AI in general	Please tell me about your current understanding of Artificial Intelligence, Machine Learning (Deep Learning, Neural Networks etc.) and Generative AI?	Consensus
	How do you think these technologies will evolve in the next 10 years?	Vision of future tech
Technologies	How do you see generative AI intersecting with other emerging technologies in the video games industry? (AR/VR for example)	
Applied to industry	How can this technology be applied to the video games industry?	Application to video games
	How do you think the use of generative AI can enhance player experiences and create new gaming opportunities which are impossible with pre-written games?	Player experience
	How do you think the use of generative AI can impact player engagement, enjoyment, and performance, and what are some potential drawbacks of this technology?	
Challenges & Opportunities	What are some of the biggest challenges that game developers face when creating video games using generative AI, and how can these challenges be overcome?	Challenge factors
	Can you think of other challenges?	
	What are the biggest opportunities that are going to come from overcoming these?	Opportunity factors
Business	How do you think the use of generative AI will impact the gaming industry as a whole, including game design & development, publishing, and revenue generation?	Distribution
	How do you think the use of generative AI in video games will impact game development pipelines and timelines, and can you think of some potential ways this process could be streamlined?	Management

Ethics	What are your thoughts on the ethical implications of using AI in video games, and how do you think these implications can be addressed? And who needs to address them?	Ethical implications
	What is your view on the debate about copyright in generative AI?	
Diversity & Inclusivity	How can the use of generative AI in video games lead to the creation of more diverse and inclusive gaming experiences?	Equality and Gender
Specifics	Are there any specific types of video games or gaming experiences that you believe would benefit most from the use of generative AI?	Type of games
	Can you think of a video game related example where AI is not going to be able to change/influence the sector? Why/why not?	
Player mindset	Do you think players will be overall satisfied with the general gameplay experience or wish for experiencing the purpose behind certain choices by the developers, and if so, how can this discrepancy be overcome?	Gameplay vs purpose
	Do you look for a deeper meaning in the games you play and if so, why?	Philosophy
	Do you sometimes wonder why developers have made a certain choice? Can you remember an example where you did & did not agree with a developer's choice?	
Social Sustainability	What are your thoughts on Generative AI displacing traditional workers and artists in the industry?	
Additional thoughts	Finally, are there any other topics or ideas related to the use of generative AI in the video games industry that you would like to discuss or explore further?	Anything not mentioned
End	Thank participants for their time & efforts	

8 RESULTS

8.1 GROUP RESULTS

Firstly, the interviews of the three groups (Programmers, AI experts and Video Game experts) were summarized. Afterwards, a general inductive thematic analysis took place by looking for patterns and themes according to the qualitative interview data. Topics that were mentioned by several (3+) industry experts were then made into a subtopic

of the results-section. The interview data has been filmed and/or recorded and has been transcribed through notes into a text which then was summarized together with their group.

All three groups had knowledge about AI and Video Games and ranged between mid-20s to mid-30s. All interviews were held in English.

PROGRAMMERS

Four experts were programmers, of which three were male and one female. Two of them were programming students (Computer Science & engineers doing their masters and PhD at KTH) while the other two worked in the field for tech companies in Stockholm and Cologne.

All programmers unanimously agree that artificial intelligence (AI) is poised to have a significant impact on various industries, particularly the video game industry. The integration of AI, particularly in virtual reality (VR) and augmented reality (AR) technologies, holds great potential for enhancing rapid ideation, fine-tuning processes, and creating more immersive experiences. Moreover, it is widely acknowledged that AI will most likely become increasingly integrated into our daily lives. However, AI is wished to serve rather as a tool making suggestions rather than making decisions.

Most programmers are of the opinion that the full realization of AI's potential will require a considerable amount of time, as the current level of technological advancement is not yet sufficient. They caution against the perception of rapid progress driven by media representation, emphasizing that the actual pace of advancement may be slower. Nevertheless, none of the programmers express concerns regarding job security, as they possess specialized knowledge of the intricate workings of code and algorithms, which will continue to be in demand. Additionally, one programmer suggests that the rapid advancement of AI poses challenges for individuals to fully comprehend its complexities. "It is getting very complicated (...) to a point where we do not understand how the AI works anymore."

The majority of programmers express enthusiasm about utilizing AI as a tool to facilitate coding, error checking, and the implementation of repetitive or challenging functions. They eagerly anticipate the potential developments that AI can bring to their work. However, the high costs associated with implementing a functional AI system, along with limitations in rendering power, present significant challenges. While cloud gaming offers a potential solution for larger companies with greater access, many countries still lack a reliable and robust mobile internet network required for playing high-graphic settings in AAA games. Furthermore, one programmer highlights that AI has the potential to bridge the gap between female individuals and programmers by increasing accessibility to a wider audience, including non-gamers.

Moreover, procedural content generation (PCG) is expected to play a pivotal role in generating content for increasingly immersive game worlds, the programmers said. The dynamic rendering of objects, non-player characters (NPCs), and environments as players progress through the game contributes to densifying large open-world and adventure-driven games, thereby enriching the game with greater vitality and content density.

AI EXPERTS

All three AI experts were male, one working for Apple, the other was a PhD working for smaller AI businesses in Stockholm and the third one was a Computer Science student at KTH.

The AI experts anticipate a significant growth trajectory for AI, particularly with the integration of AI systems such as ChatGPT into everyday applications. However, one of the most formidable challenges lies in scaling up potential models, a task that remains prohibitively expensive and accessible only to larger, more established companies. One subject pointed out that in this context, a significant obstacle involves persuading management to invest in training with these models, while acknowledging the possibility of a high failure rate. One potential solution suggested could involve training unsupervised models while accumulating substantial amounts of data and subsequently distilling

smaller models for local downloading. Additionally, enhancing data quality and addressing the engineering challenges associated with upscaling represent further hurdles.

Furthermore, the subjects agree that the primary impact of generative AI on the video game industry revolves around streamlining processes, increasing efficiency, and reducing overall time consumption, particularly by automating repetitive and time-intensive tasks. Moreover, revenue generation and various processes can be optimized within a shorter timeframe through the utilization of AI, the participants agreed.

The experts identify storytelling and generative dialogue with non-player characters (NPCs) as the most promising use cases for generative AI in the industry. The adaptation of NPC behavior based on different situations and playstyles, as well as the improvement of sound effects, audio quality, and music generation in accordance with the desired mood and emotional context of the game level, offer significant potential. Additionally, a generative approach could greatly enhance the design of game levels, quests, and missions. Furthermore, the experts explain, AI can contribute to fast and reliable cheat detection and overall game balancing.

Ethical concerns raised by the experts include issues related to the availability and appropriateness of training data, as well as addressing inclusivity by ensuring diverse representation in the training data. Additionally, vigilance seems necessary to prevent the algorithm from perpetuating societal issues, requiring careful consideration during AI training. Ensuring accessibility and allowing room for change are also important factors, the experts pointed out.

The experts reached a consensus regarding the need to protect artists' rights. While they expressed confidence that laws would eventually be established, they believed that companies are more likely to take proactive measures before legislation is enacted. To avoid the algorithm learning from copyrighted data, one expert proposed the implementation of filters that would respect artists' preferences regarding the usage of their artwork in algorithm training. Conversely, filters could also be applied to exclusively include artists and artwork for which consent has been granted. Furthermore, the experts were not concerned about a potential lack of meaningfulness in art created by AI, with one expert highlighting that individuals find meaning where they personally seek it; he said: ″Humanity will find meaning wherever they choose to find meaning″.

VIDEO GAME EXPERTS

Two Video Game experts were female, one working for an indie developer in Cologne as Finance Director, the other working at KTH/Karolinska, while the male participant works for Sega in London in Digital Sales & Marketing.

The experts assert that generative AI has the potential to achieve breakthroughs and milestones at an accelerated pace, profoundly shaping society and assuming control over mundane tasks such as image generation and prototyping. They further contend that generative AI will intersect with emerging technologies in the video game industry, particularly in AR/VR applications. These intersections may involve the integration of advanced eye-tracking and motion detection capabilities, as well as addressing perspective challenges in AR without necessitating the employment of individuals with extensive training. Additionally, generative AI has the potential to rectify existing issues, such as generating skyboxes that do not disrupt the player's preferred playstyle. Moreover, the experts propose that game difficulty levels could be dynamically adjusted based on player behavior, thereby incentivizing desired actions or prompting players to explore specific paths. This approach aims to enhance the player experience and cater to a diverse player base. Furthermore, generative AI has the potential to facilitate faster and highly accurate localization, making games more accessible to a wider range of players.

However, the experts acknowledge potential drawbacks associated with the use of generative AI in the video game industry. These concerns include the potential exploitation of spending behavior and gambling tendencies, the potential for increased game addiction, the emergence of unwanted content, player abuse of the algorithm, system abuse, the amplification of societal biases in generatively created content, and an overreliance on technology. Game developers may face limitations with their tools and encounter challenges in balancing the contributions of programmers and artists while avoiding repetitive gaming patterns.

Nevertheless, the experts believe that the utilization of AI in video games has the potential to lead to increased revenue generation, reduced manual labor, expedited adaptive development, and broader participation in game development by individuals with limited programming experience. These advancements have the potential to enhance player satisfaction and foster a more diverse and accessible gaming landscape. They agree that AI's capacity to better understand user needs and rapidly adapt to them further contributes to these positive outcomes.

One video game expert firmly believes that AI will increasingly assume tasks previously performed by humans, necessitating a shift in perspective that views AI as a tool or assistant rather than a replacement for human creativity. Creativity remains a vital component in the industry, and AI should serve to augment artistic work rather than impede it.

The foremost impact of AI on players lies in the potential for customized experiences. One expert said: "Everyone should have the chance to have bespoke experiences with AI." They continue by saying that implementing appropriate control mechanisms will enable each individual who purchases a game to realize its full potential, effectively acting as a bridge between the audience and the gaming experience. Consequently, the establishment of guidelines and regulations becomes imperative to safeguard artists' work and prevent the theft or misuse of ideas and distinctive styles. Algorithms should exclusively learn from approved and monitored sources to ensure ethical and responsible utilization, the experts agree.

8.2 THEMATICAL ANALYSIS

The analysis found several themes throughout the interviews which are listed and described in the following part. The themes emerge from topics mentioned by at least 3 different industry experts which had an opinion which they wished to share. These were gathered and summarized as topics below.

BUZZWORDS

Nearly all of the interviews commenced with industry professionals offering their commentary on the pervasive usage of the term 'Artificial Intelligence' as a buzzword in the media, particularly in the current year, to serve marketing objectives. It was noted that the implementation of AI, for the most part, remains rather rudimentary. However, the hype surrounding AI is deemed crucial in catalysing the development of the industry at present, as it encourages both individuals and companies to invest and embrace transformation. "It is not as fast as the media makes us believe it is", one programmer said, "we need the buzz for people to invest large amounts of money into the development, but it will still take a long time until it works in a sufficient way."

FUTURE AND DIRECTION

All participants concur that predicting the trajectory of AI's evolution at the present juncture is exceedingly challenging. Nonetheless, they unanimously agree that AI will exert a substantial impact on the industry in all facets of its lifecycle, encompassing development, dissemination, and perception. Additionally, the majority of participants concur that AI will become increasingly integrated into our daily lives, manifesting across the applications we utilize both at work and in our leisure time. "AI will be used in every application we use on a daily basis," one AI expert said.

The experts agree that the foremost application of generative AI is expected to emerge in the development stage, particularly during the ideation and production process by generating not only images and text but also the requisite code to implement them. The narrative-focused games, such as RPGs and MMOs, can benefit significantly from its storytelling capabilities and its capacity to adapt to player behavior, which is infeasible with pre-scripted games. In addition to that, games already relying on a randomising factor (such as rogue-like games) or building games in a sense of biome creation (like Minecraft) could make use of AI greatly by tying things together even better and create more creative maps and levels. Moreover, industry experts mention that VR has not been developed to its full potential and could benefit greatly through the support of AI to bring it to the next level with supportive hard- and software.

DIVERSITY

AI might also have the potential to foster the creation of more diverse gaming experiences by programming the algorithm to represent a broad range of diverse groups, either based on the developer's specifications or the player's preference, the experts said. Ensuring that the algorithm is trained on a diverse and inclusive dataset can help facilitate the automatic representation of diverse characters. AI could potentially bridge the gap of making technology in general and programming more accessible for all kinds of different people. "We desperately need more women in STEM," the only female programmer said. We need to find ways to make it more attractive to women and POCs to join this industry. The homogeneity is still a problem."

The participants agree that in addition to that, game developers must remain vigilant in scanning for social biases and stigmas to prevent their unintended expression. "We wouldn't want AI to come up with a storyline which glorifies war crimes which are related to actual historical events. Quality control and assurance still remains a very important human-driven element," one video game expert said. To accomplish this, developers can train the AI to interpret and use images and other data in a desired way, rather than disregarding specific information that might contain unwanted content. This approach can also enable the AI to recognize and avoid displaying explicit and undesirable material in specific contexts, thereby mitigating instances of players trying to exploit the program by introducing swear words or social stigmas, experts have pointed out.

INCLUSION

The participants believe that AI can also significantly benefit individuals with disabilities by customizing the learning algorithm to cater to their unique requirements. This approach can help the algorithm provide tailored assistance, either independently or by interacting with paired hardware, which might be essential for people with disabilities. As a result, games can offer a personalized experience for a more extensive audience that includes people with various disabilities.

Furthermore, the experts point out, the training data used to develop the AI can include individuals with disabilities and automatically generate characters in the game with a diverse range of possible disabilities. This approach can promote representation in the game and enable the occurrence of in-game consequences that reflect real-world events or actions.

TRADITIONAL WORKERS

The majority of industry experts appear to be less concerned with the displacement of traditional workers and instead highlight the positive aspects of AI. They believe that AI will become a tool for humanity, similar to how humanity has evolved over thousands of years. "[AI] ... should act rather as some sort of assistant making suggestions instead of a human being making decisions", said a programmer. The utilization of AI could enable companies to complete especially technical tasks more efficiently, allowing employees to focus on more complex responsibilities instead of spending time on repetitive tasks.

However, some experts express concern about the potential displacement of traditional workers and the need for a universal basic income to support individuals who lose their jobs due to AI. They suggest that it may become necessary to implement such a system in the event of significant job displacement across multiple industries. Currently, there is already a shortage of jobs despite an increasing workload, underscoring the potential impact that AI may have on the labour market. Nonetheless, one AI expert pointed out that the fear in humanity to lose their jobs through technology has been historical, through cars, printers, as well as computers in general. "The problem lies that it is easy to imagine jobs being taken away and automatised by AI, but it is difficult to imagine something, that does not exist yet - therefore, imagining future job openings cannot balance humanity's fear [for their jobs] to be replaced."

ARTISTS

"Artists are in dire need of protection", one programmer said. All participants share a consensus that artists require protection, which can be achieved by implementing ethical practices and laws to prevent the unauthorized use of data and artworks in AI algorithms. This approach would safeguard artists and their work from exploitation and misuse by companies utilizing AI.

Moreover, the use of AI can also present new opportunities for artists to train algorithms and design specific aspects for them to learn from, the experts said. "Just like with the industrialization and automation, people were not without jobs, but the industry changed and opened up for new jobs", a video game expert said. This approach could enhance the capabilities of AI while also promoting creativity and innovation within the artistic community.

GAMES AS ART

The majority of participants do not express concern about the potential loss of artistic integrity in video games due to the integration of AI. They believe that AI will not diminish the creativity that underpins the video game industry. It will rather give talents the opportunity to create new artworks and experiment with designs and structures that have never been done before, opening up a new world of creation.

SPENDING BEHAVIOR AND DATA PROTECTION

It is important to note that the potential risks associated with AI-driven user behaviour analysis are not unique to the video game industry. There is a concern among the participants that the algorithm could learn how users prefer to spend their money in-game, which could lead to manipulative practices that prioritize transactions over user satisfaction. Moreover, the data collected by the AI needs to be controlled and protected, following similar principles that regulate data collection on websites, the subjects point out. "I feel very uncomfortable with the idea of teaching an AI with my every action how I like to spend my money, because it is just a matter of time until this knowledge will get abused in this capitalistic society," said a video game expert.

PERFORMANCE

According to the experts, a significant challenge in using AI is its high computational demand, which can cause slower runtimes and consume large amounts of space, electricity, and processing capacity. They continue by saying that AI can complete simple tasks, the technical power required to do so can be slow and inefficient, often taking longer than traditional methods. Despite this challenge, the industry experts remain optimistic about technological advancements in the near future that will make the use of AI more efficient. This is due to the enormous potential benefits that AI can bring.

CONTROL AND EXPERIENCE

One of the primary challenges of using AI in the video game industry is the potential loss of control over the game mechanics due to the vast possibilities AI offers, especially the programmers pointed out. This concern is exacerbated by the possibility of users exploiting AI to engage in unethical practices. Another issue that has been raised is the difficulty of providing all players with a similar experience, given the sheer number of possible outcomes in AI-driven games. While such a tailored experience is desirable, game developers must introduce manual markers or points in the game to control AI and set a direction, which needs to be balanced with allowing players to have unique experiences while still unfolding the game's full potential. Consequently, game developers might need to guide players on a pre-planned path, which ensures that players have a fulfilling gaming experience with all aspects the game offers. The experts suggest some potential solutions, by rendering levels on the spot at players' progress through the game is one such solution that game developers can adopt to reduce the computational requirements of AI. "The challenge is, finding the sweet spot between giving the player a unique experience and still allowing them to unfold the games' full potential without getting side-tracked and thinking that is all the game has to offer," said one video game expert.

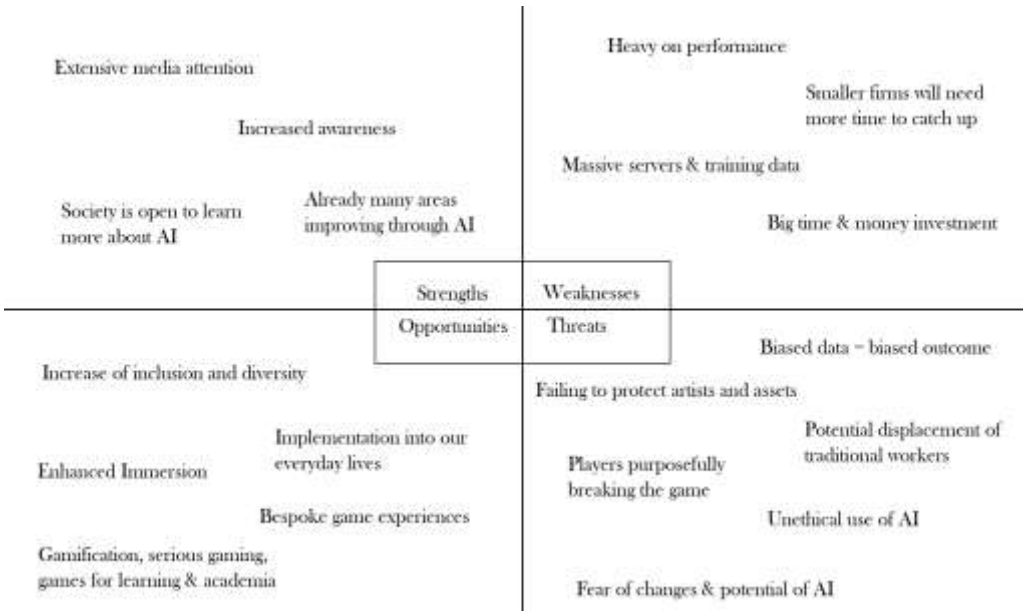
THRESHHOLD

One of the most significant opportunities arising from AI advancements is the potential for increased participation from individuals who do not fit the typical programmer mold, especially female and non-white participants pointed out. As the barriers to game development are lowered, a more diverse pool of individuals may enter the industry and occupy positions of power. This has the potential to broaden representation and result in the creation of games that cater to a wider range of audiences. Prompt engineering is expected to become an increasingly necessary field, particularly as the use of AI becomes more prevalent. Moreover, rather than having to hire individuals who have spent years studying physics and lighting to ensure their correct implementation in a game, AI can be used to automatically

generate these features based on the scene's perspective, mood, and setting, further reducing the need for manual labour, the experts agree.

BROADER USE

Many participants discussed not only the use of AI in video games for entertainment purposes, but also for more serious applications such as developing serious games for companies and implementing gamification for employees. Additionally, AI can be used in academia and practical settings, such as in the development of surgical simulations, where the AI provides real-time feedback to students on their actions and reactions, one expert explains. "Students studying medicine for example are already using VR&AR-driven simulations for prepping for real-life situations and exams. AI has the potential to make it even more immersive, more detailed, and intelligent," the AI expert said.



(SWOT analysis based on the industry experts)

The three main findings of the results section of the academic paper are as follows:

1. Perceptions and Potential Impact of AI in the Video Game Industry:

This paper interviewed three groups of experts, namely Programmers, AI experts, and Video Game experts, to understand their perceptions and insights regarding the integration of AI in the video game industry. Programmers expressed enthusiasm about utilizing AI as a tool to facilitate coding, error checking, and implementing repetitive or more challenging functions. They believed that AI's full potential would require time to be realized and cautioned against rapid progress perceptions portrayed by the media. AI experts anticipated significant growth for AI in various industries, including video games, and identified its potential impact in streamlining processes, increasing efficiency, and reducing time consumption. The experts in all three groups highlighted the potential of AI in enhancing game development, storytelling, generative dialogue with NPCs, and PCG for creating more immersive game worlds, as well as the programming and scripting aspect itself.

2. Ethical Concerns and Inclusivity:

The experts raised ethical concerns related to the availability and appropriateness of training data, ensuring diverse representation in the AI algorithms, and preventing the perpetuation of societal biases. They emphasized the

importance of protecting artists' rights and implementing filters to respect their preferences in AI training. Additionally, they discussed the potential benefits of AI in promoting diversity and inclusion in gaming experiences and game development, by customizing experiences for individuals with disabilities and creating games that represent a broad range of diverse groups. Furthermore, they also mentioned the need for vigilance in data protection to prevent manipulation of user spending behavior, preferably executed and overlooked by a governmental institution and the law.

3. Challenges and Opportunities:

The study highlighted challenges and opportunities associated with AI adoption in the video game industry. Participants expressed concerns about the high computational demands of AI, potential loss of control over game mechanics, and the difficulty of providing all players with a similar experience in AI-driven games. However, they remained optimistic about future technological advancements to make AI more effective and efficient. The experts also discussed the potential for increased participation from individuals outside the traditional programmer mold, fostering diversity in the industry. Moreover, they discussed broader applications of AI in serious games, gamification, and academia, including the development of surgical simulations with real-time AI feedback for students.

9 INTERPRETATION OF FINDINGS

The findings of the academic paper shed light on the perceptions and potential impact of artificial intelligence (AI) in the video game industry, as seen through the eyes of three distinct groups of experts: Programmers, AI experts, and Video Game experts. The interpretations derived from the results provide valuable insights into the opportunities, challenges, and ethical considerations surrounding the integration of AI in this dynamic and rapidly evolving field.

Enthusiasm and Potential of AI in Video Games:

The Programmers' group displayed a sense of excitement and optimism regarding the potential of AI in game development. They viewed AI as a powerful tool to facilitate coding, error checking, and the implementation of complex functions, which could enhance the efficiency of game development processes. The experts also recognized AI's capability to bring about more immersive experiences, particularly in virtual reality (VR) and augmented reality (AR) technologies. However, they cautioned against the perception of rapid progress in AI portrayed by the media, emphasizing that full realization of AI's potential would require time and technological advancement. Despite these challenges, Programmers did not express concerns about job security, as their specialized knowledge of code and algorithms remained in demand.

AI's Role in Game Development and Player Experience:

AI experts highlighted the significance of AI in streamlining game development processes and reducing time consumption through automation. They identified storytelling and generative dialogue with NPCs as promising use cases for generative AI in the industry. AI's ability to dynamically adapt to player behavior could offer personalized gaming experiences that cater to a diverse audience. However, the experts expressed ethical concerns related to data quality, inclusivity, and the potential biases perpetuated by AI algorithms. They stressed the importance of ensuring diverse representation in the training data and protecting artists' rights to prevent unauthorized usage of artworks in AI training.

Challenges and Opportunities for the Industry:

The Video Game experts discussed both the challenges and opportunities posed by AI in the industry. They acknowledged that the high computational demands of AI could lead to slower runtimes and increased resource consumption, but they remained hopeful that technological advancements would address these issues. However, the experts also recognized the potential loss of control over game mechanics due to AI's vast possibilities, leading to a need for balancing guided player experiences with individual exploration. The study also highlighted the potential for AI to increase diversity in the industry by making game development more accessible to individuals outside the traditional programmer mold.

Broader Impact and Social Responsibility:

The findings emphasize the broader impact of AI beyond entertainment, with its potential application in serious games, gamification, and academia. Participants discussed AI's potential in medical simulations and training, demonstrating the social responsibility of utilizing AI for meaningful and educational purposes. Moreover, the study emphasized the need for responsible AI implementation to avoid exploiting user spending behavior and to safeguard user data privacy.

In summary, the interpretations of the findings suggest that AI has the potential to revolutionize the video game industry by streamlining development processes, enhancing player experiences, and fostering greater inclusivity and diversity. However, the adoption of AI comes with ethical considerations, such as data protection, inclusivity, and artists' rights. As the industry embraces AI technology, it must do so with responsibility, guided by a commitment to delivering unique, immersive, and ethically conscious gaming experiences to a diverse and ever-evolving audience.

9 DISCUSSION

CRITICAL ASPECT:

The exploration of industry experts' perspectives on the integration of Artificial Intelligence (AI) in the video game industry has revealed a rich tapestry of insights, both illuminating the promises and cautioning against potential pitfalls. This critical discussion delves deeper into the nuances of the themes identified, offering an examination of the implications and challenges that emerge from this papers′ findings.

The Optimistic Outlook and Realistic Challenges

The consensus among participants from various backgrounds about the transformative potential of AI in the industry is noteworthy and underlines not just the optimistic wants and needs of a western society, but also the expectations of future developments. The recognition of AI as a tool to streamline processes, enhance creativity, and create personalized player experiences signals an optimistic anticipation of the industry's future. The alignment of experts on the potential applications of AI in storytelling, content generation, and sound design underscores the breadth of AI's influence on game development. This optimism echoes the broader technological trend of embracing AI as an enabler of progress across diverse domains.

However, within this optimism, a sense of realism pervades. The recognition of AI as a buzzword, often leading to inflated expectations, is a crucial insight. This observation underscores the delicate balance between harnessing the buzz to attract investment and tempering expectations to align with the current state of AI technology. It serves as a reminder of the need for transparent communication to avoid disillusionment among stakeholders.

Navigating Ethical Concerns

The discussion on ethical considerations adds a layer of complexity to the integration of AI in the video game industry. The need to safeguard artists' rights and prevent unauthorized use of data and artworks in AI algorithms reflects a genuine concern for the potential exploitation of creative works. This ethical dilemma resonates with broader debates surrounding intellectual property rights and the responsible utilization of AI-generated content.

Furthermore, the ethical implications of AI-driven user behavior analysis, particularly its potential for manipulative practices and data privacy concerns, emphasize the importance of balancing revenue generation with player satisfaction and well-being. The industry's awareness of the potential for AI to exploit user spending behavior and the call for robust data protection mechanisms demonstrate a sense of responsibility toward players and a recognition of the fine line between profitability and ethical integrity. This leads to the expectations of companies acting within these boarders to be transparent and in line with the law of various countries.

The Diversity Imperative

The consensus on AI's potential to foster diversity in gaming experiences is a laudable aspiration. The acknowledgement of AI's capacity to represent a broad range of diverse groups in games aligns with broader societal efforts toward inclusivity. However, the cautionary note regarding the need for vigilant scanning of social biases and stigmas in AI-generated content is a testament to the industry's awareness of the potential pitfalls of AI in perpetuating existing inequalities.

Balancing Creativity and Control

The tension between AI's capacity to provide tailored experiences and the risk of losing control over game mechanics underscores a pivotal challenge. The concern about the potential over-reliance on technology and the risk of unintended player exploitation highlights the delicate balance that developers must navigate. The proposition to use AI to render levels on the spot as players progress through the game offers a potential solution, yet it also invites a reconsideration of the concept of authored experiences versus dynamically generated content.

A Glimpse into the Future

The participants' vision of AI's broader applications beyond entertainment, including its role in serious games and simulations, opens a range of possibilities. This expansion aligns with the trajectory of technology adoption in various industries and underlines the transformative potential of AI-driven solutions.

In Closing

This critical discussion underscores the multidimensional nature of integrating AI into the video game industry. The findings reflect an industry eager to embrace innovation while acknowledging the need for responsible and ethical deployment. As AI's role in the industry evolves, ongoing dialogue and collaborative efforts will be essential to harness its potential for positive impact while navigating the challenges that lie ahead. The future of AI in gaming hinges not only on technical advancements but also on the industry's collective wisdom in steering its course.

Summary

The industry experts largely agreed on the technical aspects of this topic. Additionally, they contributed a human element to the discussion by expressing their unfiltered opinions. All participants acknowledged that the advancement of AI represents a significant milestone towards a more digitalized future. However, they also noted that this progression began long before the release of ChatGPT in November 2022. For example, GPS was once considered AI, and social media platforms such as Instagram, Facebook, YouTube, and Tiktok have been using algorithms for years to determine people's preferences and expand on the content they are shown. In fact, the majority of people in the Western digitalized world use AI daily without even realizing it, the experts said.

Furthermore, the participants agreed that the changes currently taking place may seem substantial, but we are only scratching the surface of AI's true potential. Developing AI for practical use by companies will take years due to the substantial amount of data required, as well as the cost and rendering power associated with it. The demand for AI may be significant, but there are not yet enough individuals capable of fully understanding the most complicated algorithms and programming them according to a company's needs.

Moreover, according to the interview data, the current hype surrounding AI and ML is merely a buzzword, and laws and regulations must be put in place to protect traditional workers and artists. Some participants believe that AI will become a tool for humankind, just as we have used tools for thousands of years. They argue that it will most likely replace simple and repetitive tasks, allowing human workers to focus on more complex duties and enabling companies to achieve more work in less time with the same amount of people.

However, others experts are concerned that AI will replace workers at an unprecedented rate, creating a need to consider the consequences of this displacement. They speculate that implementing a basic income might be necessary,

and that the impact of AI on society will be greater than we currently assume. Nonetheless, new jobs will likely emerge, just like it historically always has happened when new technology was introduced.

CRITICAL DISCUSSION OF THE CHOSEN METHODOLOGY

The methodology was based on two parts, a literature review and a case study with industry experts. The literature review has been written in early 2023, which had a significant upside of many news outlets writing about it, as well as a lot of research being published, but it acted as disadvantage as well, because of its fast pace. To the time of writing this thesis (January 2023 – June 2023) news about the advancements of Artificial Intelligence are updating daily, updates get more frequent and the popularity of GPT in particular grows at a rapid rate, therefore making this thesis a product of its (extremely fast-paced) time. Nonetheless, it is valuable building block for companies to make decisions regarding AI in games, as long as newer advancements are being double-checked according to its time.

The second segment comprises interviews with experts who have also been exposed to media content, which may have exerted some influence on their viewpoints. Nevertheless, these experts were able to recount their experiences with AI and establish correlations with the news presented in the media. Determining the precise extent of media's impact on an expert's perspective proves challenging; however, frequently, these experts were capable of critiquing the media for its employment of buzzwords and excessive optimism, which, in reality, often exaggerates the actual progress achieved in the field. Furthermore, it is imperative for the reader of this paper to bear in mind that the inclusion of human participants in a study inherently introduces certain biases, given the inherent predispositions of human beings. The obligation has rested upon the researcher to mitigate these biases to the best of their ability and provide an accurate contextualization.

10 CONCLUSION

The majority of industry experts stated that generative AI has a wide range of use-cases, especially in video games. It is most likely going to lead to new and unique gaming experiences with a more streamlined, effective, and efficient workflow than before. It has already opened up the potential to customized gaming experiences that adjust to the player′s playstyle, difficulty setting, and desired narrative. The wide range this can offer is impossible to achieve with human-narrated pre-written video games. This will most likely have a direct effect on player engagement, enjoyment, and performance, by giving players the opportunity to create their own story and customized experience depending however they choose to play the game. The participants agree that in addition to that, AI has the potential lower the border and open video games up to non-coders and people with limited video-game-creation experience, giving the opportunity to have a wider representation of diversity and inclusivity.

According to the interviewed experts, here are several challenges developers face when creating personalized games, such as processing power and rendering time, the engineering of the algorithm itself and the lack of understanding why the algorithm sometimes acts in a specific way, over to high expenses and data security, and also the human element of biased training data, convincing management to accept potential failure, or players wanting to abuse the algorithm for their own purposes like cheating, or hacking, over to ethical debates whether creative and artistic tasks should be taken over by AI and how much power the algorithm should have to make suggestions or decisions. Nonetheless, there are many ways developers could potentially try to tackle these problems since the outcome potentially justifies its use. The subjects suggest that his could be done by controlling training data, adding filters for artists, and teaching the algorithm to ban cheaters and how to handle potential threats, as well as rendering on a smaller scale.

Lastly, the majority of experts agree that the ethical implications AI-personalisation in video games are complicated, the discussions are ongoing and there is no definitive answer found at this point in time. Nonetheless, the general consensus is that artists need protection from their art being used and re-used by an AI, and that the effort companies are already putting in to protect them is good, but most likely not enough and that laws need to be set into place where needed. In addition to that, the experts wish that AI should generally be used as a tool taking over technical

and repetitive tasks and act as an assistant, rather than displacing traditional workers. Despite that, the subjects unanonimously agree, it is rather unlikely that there is not going to be a shift happening across many industries of jobs changing and workers achieving more in less time (from the standpoint of a westernized capitalistic society), that there might be less workers needed in traditional areas, but that there might be more job opportunities requiring a collaboration between humans and AI.

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