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From Pong to Narrative: The Evolution of AI in Gaming

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As video games evolve, the role of artificial intelligence also referred to as AI has been essential. Games have come a long way from being small and having rudimentary logic to being extremely complex and narrative-driven. This research paper will dive into the vast history of AI in gaming, following its path from the simple ball-paddle mechanics of Pong, to the intricate entanglements presented in modern games such as Fortnite, Call of Duty, League of Legends, and more. The interplay between game design and AI development doesn't just show how far we have come in technological advancement, but rather it shows our creative evolution. Who would've thought 50 years ago, you'd be able to play games with players across the world at the same time? What can we expect in the next 50 years as AI continues to develop?

The scope of this paper will encompass important historical milestones in the evolution of AI within games. I will analyze how each era of gaming had different technologies and capabilities, and also how design philosophies influenced the introduction of AI—starting with the early incursion of games like Pong and Space Invaders which laid the foundation of interactive design. But, as technology advanced so did AI. Its complexity and versatility have gone through the roof in recent years, and will only get stronger. It has evolved from being statistic and rule-based to becoming dynamic, learning, capable of decision-making, and even simulating behavior.

Moreover, this exploration will go into AI companies such as Hidden Door, and games like Flow by Jenova Chen. Hidden Door has contributed to narrative techniques and dynamic storytelling. By deepening our understanding of the historical context and deep development of

AI in gaming, I will aim to offer insights into current trends and potential directions. Studying these specialized aspects of AI is significant to appreciate the depth, nuance, and artistic potential that artificial intelligence brings to the entire gaming experience, helping transform it from entertainment to a world of complex story-telling.

Simply put, we can start from the beginning of AI in games. Foundational games like Space Invaders and Pong laid the base for the future of AI gaming. Pong is considered one of the earliest arcade video games and introduced artificial intelligence in what one could say its "primitive" form. In 1972, Atari released this game at the time, which was a basic table tennis game. The AI in Pong was simply moving the paddle back and forth to try to hit the ball based on the arranged patterns. No learning was involved in this AI; the movement was extremely predictable and repetitive. Although it was simple, this game was revolutionary at the time, and it showcased the potential games had in the future.

Another game, Space Invaders, released in 1978, brought us a more advanced version of AI. The idea of the game was simple. It featured a row of aliens that would move side to side and slowly descend onto the player. This AI, like Pong, followed a set of predefined rules. The difference was that it introduced elements like speeding up, and some random movements as aliens decreased. It also added a level that was unpredictable and gave players a challenge. Even though it was a small change, this game was a big step in the right direction from Pong's AI.

Early examples of AI in video games are extremely important because they demonstrate the potential for AI to make fun and challenging games, even with the limited technology they had at the time. Another reason that these early examples of AI in video games are important is because they set the stage for any future developments in games using AI. By setting the basic principles of AI, and creating an illusion of intelligence and flexibility within a set of rules, these

games were able to do things like highlighting the balance between challenge and accessibility. You can't have the game become extremely hard or very easy for obvious reasons, and pioneer games like Pong and Space Invaders laid the foundation for this.

While these "ancient" games may look simple and primitive by today's standards, we must not forget the impact they had on modern gaming, and gaming in the future. They are the games that paved the way for complex AI systems, that we see today in the modern games we play and love. Pong and Space Invaders are just some of the original games that were able to set the trajectory for today's standard of gaming.

As AI evolves in games, going from basic algorithms to complex behaviors, we are able to witness a large leap in player experience and game design. AI also transferred from static to dynamic, which helped adapt to player's actions and improve the unpredictability of game environments. In the early years of gaming between the 1950s-1970s, a foundation was laid. According to the article *Evolution of AI in Games: From Pixels to Deep Learning*, the author states, "...the seeds of AI in games were sown," with notable examples like the "Nim" game by Christopher Strachey, showcasing "early signs of AI in gaming."

Years rolled by and as we moved into the 1980s, gaming changed. As technology advanced, games moved towards text-based like Zork. The articles continues on by explaining, "Games like Zork employ simple natural language processing algorithms to interpret player commands. Though primitive by today's standards, these systems paved the way for more sophisticated interactions between players and virtual worlds." Zork was an instant hit, and gaming continued to take find its place in the world.

The 1990s introduced us to things like NPCs (non-player characters) and rule-based systems in RPGs (role-playing games). The article states, " The 1990s witnessed a surge in the

popularity of role-playing games (RPGs) and the introduction of non-player characters (NPCs) governed by rule-based systems. These NPCs followed predefined scripts and decision trees, offering a semblance of intelligence. Games like “Ultima” and “Baldur’s Gate” demonstrated early attempts to create virtual characters with basic decision-making capabilities.” Baldur’s Gate for example was released on December 21st, 1998 and “ is a series of role-playing video games set in the Forgotten Realms Dungeons & Dragons campaign setting.”

In the 2000’s gaming took off. I remember times as a kid when my friends and I couldn’t wait to go home and play games. We would go to each others’ houses and play video games until we were forced to turn off our consoles and finish our homework. Halo, an amazing game, really took the world by storm and represented huge advancements in AI. The article explains, “ The mid-2000s witnessed the integration of procedural content generation in games, a technique driven by AI. Games like “Spore” used algorithms to create dynamic and diverse game worlds, reducing the need for manually designed content. This not only enhanced the gaming experience but also significantly reduced development time.” Diving into the 2010s, machine learning and dynamic AI came on the scene. The author went on to explain, “ The 2010s marked a paradigm shift with the widespread adoption of machine learning techniques in gaming. Game developers started incorporating algorithms capable of learning and evolving based on player interactions. This dynamic AI led to more immersive and challenging experiences where NPCs could adapt in real-time to player strategies.” I learned simple algorithms in my previous classes, and it allowed me to appreciate how far games have come in recent years. The games played today are inlaid with complex algorithms and machine learning.

Currently, games like Red Dead Redemption 2 and the Last of Us Part 2 are using deep learning. According to an article by AWS, the author writes, “Deep learning is a method in

artificial intelligence (AI) that teaches computers to process data in a way that is inspired by the human brain. Deep learning models can recognize complex patterns in pictures, text, sounds, and other data to produce accurate insights and predictions." As more advancements are made in AI, gaming will only become more enhanced, and will gain even more popularity than ever before. Deep Learning models are being studies across the world, is certainly looked at as a large part of future gaming. In the article *AI and the future of gaming for game devs,* by Inworld Team, the author explains, " As the industry grows increasingly competitive, video games must find new ways of delivering innovative experiences to capture players' attention… Our research found that almost everyone who plays video games feels that AI will enhance gameplay." The progression in AI thus far is extremely promising, and I am excited about what the future holds.

Moving on to real-world companies and their effects on gaming, Hidden Door needs to be mentioned. Hidden Door is the intersection of machine learning and entertainment and represents an important advancement in the use of AI in gaming. According to an article by *thebuisnesswire,* the author writes, " Hidden Door is building the narrative multiverse at the intersection of machine learning and immersive entertainment. Launching in early 2022, our first product is a social game platform for playing stories with friends across a variety of shared creative universes." Their CEO and co-founder Hilary Mason explains, " We connect by telling stories together…It's finally possible to build machines that make the story itself computable, giving anyone the power to create stories in unique ways. The challenge is to design a system that can improvise alongside creative players while guiding diverse and safe story experiences, and we believe we've done just that." Hidden Door is showcasing the future of AI in gaming. The platform's approach involves friends teaming up to mix up story worlds that are shown as interactive graphic novels. This includes a playful AI narrator that enables players to improvise

endless adventures with generated NPCs, items, and locations. These elements can be collected, traded, and shared, allowing for the creation of new worlds and stories, and plans to expand to a marketplace for content from professional writers and artists (buisnesswire).

Jay Chi, founding partner of Maker's Fund, actually invested in Hidden Door and saw its potential early. He states, " Our investment in Hidden Door was driven by their vision for a dynamic and playful narrative platform that brings people together around the magic of telling stories…" The future of AI in storytelling and narration is bright thanks to companies like Hidden Door. The gaming industry will have plenty to be thankful for as Hidden Door redefines the narrative possibilities through AI. This showcases how something like gaming can be transformed into a place for collaborative and creative storytelling using AI.

Reflecting on AI evolution throughout the years, and the historical impact it has had shows us a great transformation. From the basic logic-driven AI of early arcade games to the complex games today, AI has come a long way and is still just beginning. Today's AI doesn't just make gameplay more fun, but it also adds beautiful narratives, creates emotional engagement, and defines player experiences. As AI continues to expand, it promises more interactive gaming worlds, dimming the line between virtual and reality. We've learned through history that AI is boundless, and its potential to revolutionize the gaming industry must be watched closely. In the article *The Future of AI in Gaming,* the author explains the endless possibilities AI creates. He explains, " AI might create the entire, realistic landscapes from scratch, calculating the walls it can and can't walk through instantaneously…Data scientists have wanted to create real emotions in AI for years, and with recent results from experimental AI at Expressive Intelligence Studio, they are getting closer. It won't be long after they succeed that we could see these AI in games." To some, this might seem scary or different, but advancements in technology are usually created

for the betterment of society. It's up to us to figure out how to use AI for the improvement of not just gaming, but also the improvement of life as a whole.

The author reassures us that success is not made overnight. He states, " Remember, VR started with the Nintendo Virtual Boy, a notorious failure. It took a while, but the concept of VR survived and has improved. So expect a few hiccups as these advanced AI are implemented, but you can also be sure that we'll get past them in time." The future of gaming in AI will take some time and might not be here right now, but it will be tomorrow.

Works Cited

Admin, Bizclik. “The History of AI in the Gaming Industry.” *AI Magazine*, BizClik Media Ltd., 12 Apr. 2023, aimagazine.com/articles/the-history-of-ai-in-the-gaming-industry.

Chen, Jenova. “Welcome to Flow in Games.” *Welcome to Flow in Games*, www.jenovachen.com/flowingames/. Accessed 20 Nov. 2023.

“Hidden Door Launches AI Game Platform to Build the Narrative Multiverse.” *Business Wire*, 16 Mar. 2022, www.businesswire.com/news/home/20220316005334/en/Hidden-Door-Launches-AI-Game-Platform-to-Build-the-Narrative-Multiverse.

Hillary. “The Evolution of AI in Games: From Pixels to Deep Learning.” *TechBullion*, 13 Nov. 2023, techbullion.com/the-evolution-of-ai-in-games-from-pixels-to-deep-learning/.

“Jenova Chen.” *Wikipedia*, Wikimedia Foundation, 1 Nov. 2023, en.wikipedia.org/wiki/Jenova_Chen.

Jones-Read, Jesse. “The Future of AI in Gaming.” *Video Game Design and Development*, 7 Sept. 2023, www.gamedesigning.org/gaming/ai-in-gaming/.

Sheffield, Brandon. “Interview: Jenova Chen and Thatgamecompany’s Vision of the Future.” *Game Developer*, 27 May 2009, www.gamedeveloper.com/pc/interview-jenova-chen-and-thatgamecompany-s-vision-of-the-future.

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