Utilizing AI in Game Playing: An Exploration of Techniques and Applications



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Abstract

The gaming industry has historically leveraged the use of advanced digital technologies in developing gaming hardware and software applications (on mobile, web, and video platforms) leading to significant improvement in the overall gaming experience for users. In recent times, gaming companies and casinos have switched to using machine learning algorithms as tools for predictive analytics, modelling complex systems, enabling high-speed processing functions, accelerating realistic interactions in virtual environments (speech generation, natural language processing, etc.), and creating sophisticated and personalized user content. As machine learning facilitates improved user experience in real-time or asynchronous modes, more gaming companies and casinos would be able to increase their annual revenues while taking advantage of the current exponential growth in the value of the global gaming market – estimated at $173.7 billion as of 2022. One of the major drivers of this growth is the COVID19 pandemic with more people turning to offline and online game platforms. Similarly, with many casinos closed due to national lockdowns, there was a sharp rise in online gambling in the United States, Mexico and some parts of southern side of India placed bets on different sport games with a few clicks on their smart devices. While online sports betting is legal in some countries like the United Kingdom and some states in the United States, using machine learning algorithms to enhance gaming platforms could lead to several ethical challenges ranging from consumer issues like gambling addiction and invasion of user data privacy to potential algorithmic bias and errors. This paper will evaluate a machine learning application for casinos in the United States (patented by Gaming Analytics Inc), to better understand the model and its impact on relevant stakeholders – using a criteria list that includes algorithm accuracy, explain ability, transparency, security, and unbiasedness. It will also capture potential drawbacks from a policy perspective and make recommendations as a response to existing or potential challenges. The project writing would rely on multiple secondary data sources such as peer-reviewed publications, articles, white papers, and patent documentation.

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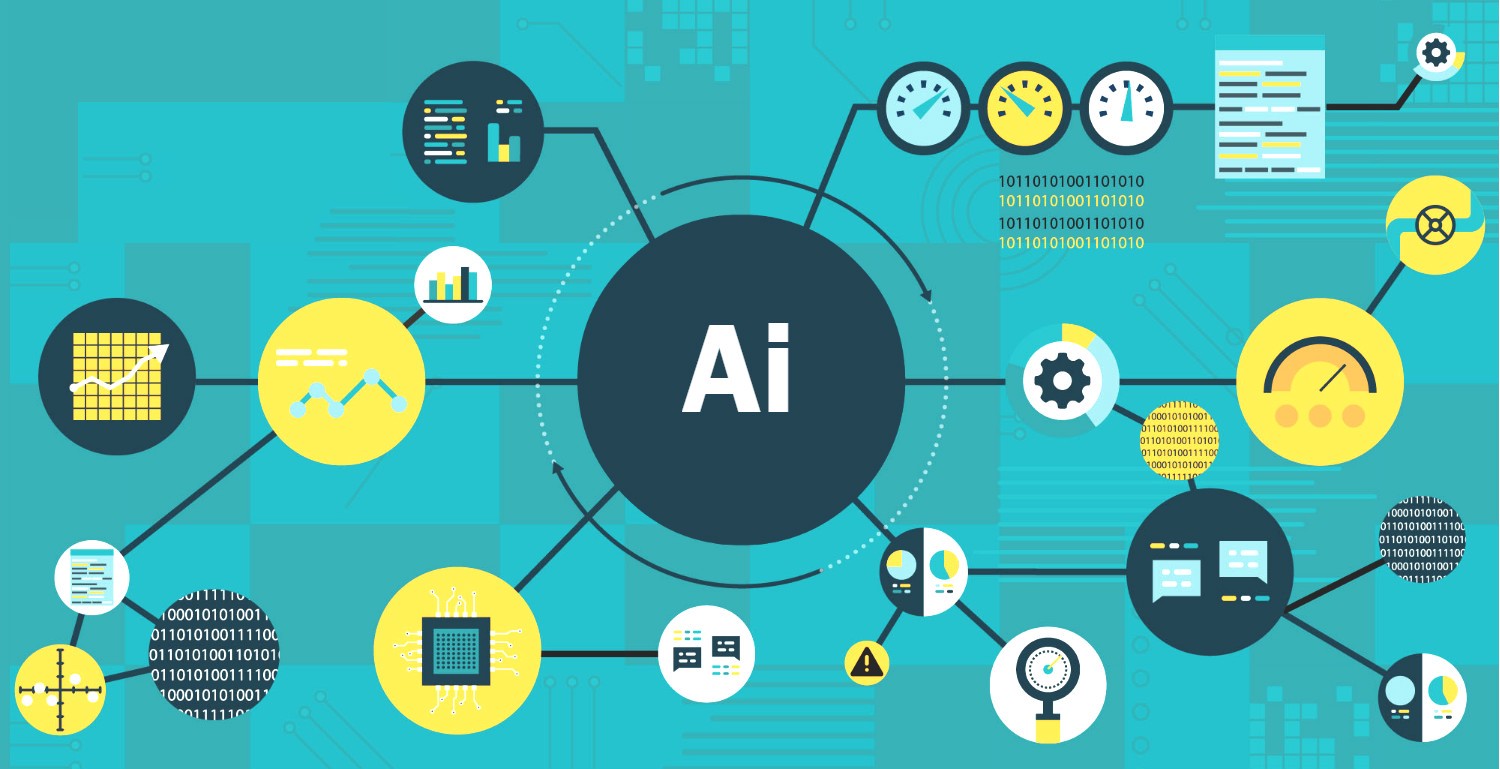
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Introduction



The advancement of Artificial Intelligence (AI) has brought significant changes to the gaming industry. With the help of AI, game developers can create games that have adaptive and intelligent behavior, enhancing the gaming experience for players. This project will explore the various ways AI can be utilized in game playing, the techniques used, and their potential applications.

It is no longer news that artificial intelligence (AI) capabilities have become commonplace in industries3 such as e-commerce, supply chain, healthcare, manufacturing, banking, security, and defense, while in some industries (such as gaming), using AI to automate and optimize operations is still a relatively new pursuit. Since the concept of machine-driven intelligence or AI was first developed4 between the 1920s and 1950s, there has been exponential growth in the use of AI in recent times3 owing to advanced algorithms, more sophisticated and improved computing power, speed, and storage, and massive datasets from different data sources. According to Statista, the global artificial intelligence market is currently estimated to be worth $327.5 billion5 and it continues to grow as more companies invest in both talent and AI technologies for building out use cases. Standard use cases for AI and machine learning focus on generating customer insights, optimizing operations, making predictions, and ultimately, improving customer experience. The global gaming industry is playing a catch-up game with other industries. Gaming companies and casinos are now implementing new AI and machine learning features in video games and gambling platforms to enhance users gaming experience which will cast the speed of AI users as with vast usage helps them to collect more and more data as we know for AI system the primary fuel for the system is the data part.

Overview of AI/ML Applications in The Gambling Industry

The global casino and online gambling market are currently valued at $230 billion11 with U.S gambling revenue12 hitting $13.6 billion in the second quarter of 2021. The bulk of current AI/ML applications in the gambling industry focuses on the customer side, enabling casino operators to automatically identify patterns so that they can adjust service in real-time. These applications are typically developed for payment systems, enhanced player tracking systems, facial recognition/biometrics and to forecast the win chance of players. In 2019, casino operators in Macau13 deployed AI-enabled cameras and smart poker cards for monitoring the playing habits of patrons and for tracking individuals who are likely to spend and lose big. It is said14 that these applications help casino operators curb fraudulent incidences online or on-site, increase the chances of acquiring new players in existing customer loyalty programs, and to ensure accuracy, efficiency, and integrity in casino venues. AI is also used to improve revenue streams15 from casino games and slots by creating an appealing user interface, optimizing game design, and marketing/advertising campaigns for target groups. A significant volume of data is generated from online and offline gambling platforms. These data contain information about player behaviour and game performance. Using ML algorithms, predictive models are built to both discover and predict patterns in the collected data, with outcomes such as the ability to predict online player churn behaviour or rate, ability to analyze16 habits and wishes of individual players or groups, and ability to develop winning game-playing strategies 14 Player engagement is very critical for casinos in terms of revenue generation. Therefore, access to machine learning algorithms that improve player engagement is highly welcome. For example, electronic gambling machines17 now use simulation-based AI to keep players engaged for extended playing sessions. Furthermore, many casinos are adopting the use of AI for customer service efficiency instead of depending solely on customer support teams. By using chatbots built with natural language processing (NLP), algorithms extract and learn information, from players’ spoken and written words. However, chatbots would need access to a lot of real-time, user data to be able to deliver a properly personalized experience With several consumer protection laws on gambling by the EU and the U.S, gambling companies and casinos are tasked with ensuring that their operations do not cause potential harm to customers – what is called problem gambling – while at the same time, protecting their brands. According to the National Council on Problem Gambling, problem gambling19 is defined “as all gambling behavior that compromise, disrupt, or damage personal, family, or vocational pursuits. The symptoms include increasing preoccupation with gambling, a need to bet more money more frequently, restlessness or irritability when attempting to stop, “chasing” losses, and loss of control manifested by continuation of the gambling behavior despite mounting, serious, negative consequences. In extreme cases, problem gambling can result in financial ruin, legal problems, loss of career and family, or even suicide”. Therefore, gambling operators have started implementing several AI tools that would help them identify unhealthy gambling patterns to prevent cases of underage gambling and addiction in people of all ages. They can monitor21 player behavior and compare it with the known behaviors of gambling addicts. If both data share significant similarities, a casino operator may advise the player to go slow on a game, take a break or limit the playing sessions for some hours. Generally, both gambling operators and regulators support responsible or sustainable gambling as opposed to problem gambling. Responsible gambling incorporates concepts of harm minimization, harm reduction, and consumer protection as part of overarching guidance that helps protect players from potential harm (familial, financial, professional) that excessive gambling may cause while simultaneously providing benefits to the local community.

Currently, the top AI and machine learning use cases in the gambling industry are:

• For Predicting Future Human Behavior: By understanding when a patron is likely to play next, how much they will play, and if they would use their offers, casinos using AI models are better positioned to make targeted marketing decisions. They can now offer the right deals precisely to the right audience thereby saving on marketing and advertising costs.

• For Tracking Player Churn Rate: Upselling an existing customer is less expensive than acquiring a new customer. Therefore, with ML models, a casino operator can identify customers who are unlikely to play at the casino again and potential reasons for player churn rate. Using this information, the ML model would be able to determine what offers are most likely to increase customer retention, when to make those offers and how to accurately target desired customers.

• For Floor Optimization: Using historical data, ML models are built to understand why certain games perform the way they do, based on factors such as type, location, or demographics. This information is used to make decisions on where to place games on the casino floor for optimal return.

• For Assessing Lifetime Value: With ML, a player’s behavior can be modeled to show historical value and also capture future behavior and value. Players who are deemed more valuable are identified and converted into loyal customers.

• For Demand Forecasting: Using forecasts of the number of players and guests at a casino property in a given time, predictive AI models are used to determine when to schedule staff working hours and for daily/monthly budget plans.

• For Anti-Cheating and Anti-Money Laundering: AI models help gambling companies detect cheating quickly while identifying suspicious behavior by either players or employees. Also, since many rule-based systems for identifying money laundering produce too many false positives predictive AI models are used to minimize these false positives, thereby redirecting resources on actual money laundering cases either internally or externally.

Code

#include <stdio.h>

#include <stdlib.h>

#include <time.h>

#define MAX\_GUESSES 5

int main() {

srand(time(NULL));

int player\_balance = **1000**;

int bet\_amount, guess, num\_guesses = **0**;

printf("Welcome to the number guessing game!**\n**");

printf("You have $%d to start with.**\n**", player\_balance);

**while** (player\_balance > **0**) {

printf("Enter your bet amount (minimum $10): ");

scanf("%d", &bet\_amount);

**if** (bet\_amount < **10**) {

printf("Minimum bet amount is $10. Please try again.**\n**");

**continue**;

}

**if** (bet\_amount > player\_balance) {

printf("You don't have enough money to make that bet. Please try again.**\n**");

**continue**;

}

printf("I'm thinking of a number between 1 and 100. Can you guess it in %d tries?**\n**", MAX\_GUESSES);

int number = rand() % **100** + **1**;

**while** (num\_guesses < MAX\_GUESSES) {

printf("Guess #%d: ", num\_guesses + **1**);

scanf("%d", &guess);

**if** (guess == number) {

printf("Congratulations, you guessed it in %d tries!**\n**", num\_guesses + **1**);

player\_balance += bet\_amount;

**break**;

} **else** **if** (guess < number) {

printf("Too low!**\n**");

} **else** {

printf("Too high!**\n**");

}

num\_guesses++;

}

**if** (num\_guesses == MAX\_GUESSES) {

printf("Sorry, you didn't guess the number in time. The number was %d.**\n**", number);

player\_balance -= bet\_amount;

}

printf("Your new balance is $%d.**\n**", player\_balance);

**if** (player\_balance < **10**) {

printf("Sorry, you're out of money! Game over.**\n**");

**break**;

}

char play\_again;

printf("Do you want to play again? (y/n): ");

scanf(" %c", &play\_again);

**if** (play\_again == 'n' || play\_again == 'N') {

printf("Thanks for playing!**\n**");

**break**;

}

num\_guesses = **0**;

}

**return** **0**;

}

Project plans

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Activity | Start Date | End Date | Duration | Status | 15-Feb | 16-Feb | 17-Feb |  | 18-Feb | 19-Feb | 20-Feb | 21-Feb | 22-Feb | 23-Feb | 24-Feb | 25-Feb | 26-Feb | 27-Feb | 28-Feb | 01-Mar |
| Activity 01 | 15-Feb | 16-Feb | 2 | completed |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Activity 02 | 16-Feb | 18-Feb | 7 | completed |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Activity 03 | 19-Feb | 20-Feb | 4 | pending |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Activity 04 | 20-Feb | 21-Feb | 2 | completed |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Activity 05 | 21-Feb | 21-Feb | 1 | completed |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Activity 06 | 22-Feb | 23-Feb | 3 | pending |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Activity 07 | 23-Feb | 25-Feb | 7 | pending |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Activity 08 | 25-Feb | 26-Feb | 4 | completed |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Activity 09 | 27-Feb | 28-Feb | 3 | pending |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Activity 10 | 01-Mar | 02-Mar | 2 | completed |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

CONCLUSION

While there is currently no federal regulation of AI in the India both government and the private sector need to collaborate in ensuring that technological advances are not used for unethical purposes or to exacerbate existing social issues. The gambling industry is experiencing a massive influx of AI breakthroughs and it is the responsibility of policymakers to equip themselves with the required expertise for dealing with potential challenges caused by these innovations. For example, gambling addictions existed before the advent of AI/ML models. If AI/ML models used by casinos and gambling companies have the potential to increase the cases of gambling addictions, then, policy experts should be thinking of ways to address this public health issue before it snowballs into a national pandemic.

The project will conclude that AI has significant potential in game playing and has already led to the development of more intelligent games. The study will provide insights into the various ways AI can be utilized in game playing, the techniques used, and their potential applications. The research will also highlight the benefits and limitations of AI in game playing and suggest potential future developments.

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