Enhancing User Experience in PS5 Gaming Through Predictive Analysis

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Abstract—**Optimizing the user experience on gaming platforms is critical for both players and publishers, especially given the industry's rapid growth. Understanding the factors that influence a game's success is critical. The purpose of this study is to identify and predict the factors that influence a game's popularity and user satisfaction using Kaggle's PS5 Games Dataset: 2024 Update. To predict a game's average rating, the study uses machine learning techniques, specifically a RandomForestRegressor model, which analyzes features such as release date, publisher, age restrictions, and user ratings. The model performed satisfactorily, demonstrating the significant impact of various features on user ratings. Key findings highlight the significance of release dates and publishers in determining a game's success. These accurate predictions can help publishers create more appealing titles and improve the gaming experience for users by identifying the most engaging game characteristics.**

Keywords—PS5, predictive analysis, user experience, gaming, machine learning, RandomForestRegressor

I. INTRODUCTION

With gaming's growing popularity, understanding the key drivers of a game's success is critical for both gamers seeking enjoyable experiences and publishers looking to create profitable titles. The dataset contains a wealth of information, including release dates, publishers, age restrictions, and user ratings. Using advanced machine learning techniques, we can uncover patterns and correlations in data to improve user experiences and guide publishers in developing more appealing titles.

A. Background Information

The gaming industry has expanded exponentially, making it critical to understand what drives game success. Using data analytics, we can identify patterns that contribute to user satisfaction and game popularity.

B. Research Problems or Questions

- How do release dates affect game popularity?
- What is the influence of publishers on user ratings?
- How do age restrictions impact user engagement?
- Can we predict user ratings based on game attributes?

C. Significance of the Research

This research is significant for a variety of reasons. For starters, it provides actionable insights to game developers and publishers, allowing them to make more informed decisions about game design, marketing, and release strategies. The study identifies the key determinants of game success, which helps stakeholders understand what drives user engagement and satisfaction, allowing them to better tailor their products to market demands.

Second, the study advances the academic field by incorporating predictive analytics into gaming research. The creation of a strong predictive model for game ratings demonstrates the power of machine learning to improve decision-making processes in the entertainment industry. This interdisciplinary approach combines data science and game development, providing a fresh perspective on how technology can be used to enhance user experiences.

Finally, understanding the factors that influence game success can help publishers better allocate resources and manage risks. By predicting the potential success of new game releases, publishers can optimize their investments and marketing efforts, resulting in increased profitability and long-term growth in the competitive gaming market.

II. LITERATURE REVIEW

Over the last decade, there has been a growing interest in improving the user experience on gaming platforms, particularly in terms of predicting game popularity. This literature review synthesizes research papers and existing documents, with a focus on improving user experience in PS5 gaming through popularity-based predictive analysis.

A. Serious Gaming for Predictive Analytics

This paper elaborates on serious gaming with predictive analytics, explaining how games enhance updated decision support systems based on cognitive engagement and interactive learning features. In a broader framework on the role that games play in techno social environments for predictive analytics, in the use of complex models that simulate real-world processes to enable interaction and enhance the cognitive capacity of the user, it is widely explored [1].

Overview of the Literature: Literature indicates that serious games are advancing from traditional training simulations into more complex decision-support instruments in which people are able to understand and engage with predictive models. The paper does call upon a number of studies and frameworks talking about the cognitive benefits of serious gaming, whereby problem-solving skills are enhanced and a way to improve decision making through better interactive and more immersive experiences is presented.

Key Theories and Concepts

- Cognitive Enhancement: The use of game to improve cognitive processing, by engaging more brain functions not otherwise involved when doing normal analysis on everyday tasks.

- Serious Games: Games designed not solely for entertainment but in the aid of training, learning, and making decisions in complex real-life contexts.

- Techno social Predictive Analytics: The integration of technological and social models to forecast results and underpin policy and strategic planning.

Controversies and Gaps in the Literature: Although the potential of serious games in cognitive enhancement and decision support is widely lauded, practical benefits are still being worked out. More and stronger empirical evidence is necessary, and the document considers that evidently cognitive benefits from playing serious games have to be stipulated. There is an ongoing debate around best practices in the integration of serious games with predictive models in order to optimize user experience while maintaining the required level of analytical accuracy.

B. Early Prediction of Student Profiles Based on Performance and Gaming Preferences

The study examines the impact that gamification has had on student engagement and performance, more particularly in college. It in fact extends from earlier works that indicated that gamified learning was effective in one aspect: significantly raising the levels of students' participation and success, although it has generally disregarded individual student differences and preferences [2].

Overview of the Literature: The literature underlines the increasing adoption in education due to the potential of gamification to increase student engagement and learning outcomes. There is evidence about how student motivation for learning can be enhanced by game-based points, badges, and leaderboards, but effectiveness varies widely depending on the types of students, which will be tried in this paper to categorize and understand better.

Key Theories and Concepts: The main concepts include the use of machine learning to categorize students based on their engagement and performance in a gamified environment. Cluster analysis was employed in this study to categorize students as "Achievers" or "Underachievers" based on their interaction with gamified elements and performance aggregated from the.

Gaps and Controversies in the Literature: Such research gaps exist regarding how differently students respond to the strategies of gamification. Most of the existing studies, majoring in the use of a one-size-fits-all approach in the application to student needs, do not assure effectiveness. It does so by guiding people on how data on the performance of the students and the preferences for gaming can be used to identify student types in the course of the learning process, hence making it possible to have different educational approaches.

C. Measuring and estimating Key Quality Indicators in Cloud Gaming services

The document explains Key Quality Indicators of Cloud Gaming services and analyzes the challenges in providing high-quality gaming experiences for cloud platforms. There is a strong emphasis on how network performance contributes to the quality of the cloud gaming service, both under network conditions such as packet loss and latency [3].

Overview of the Literature: The review presented several research efforts regarding the impact of network performance on cloud gaming, from research into the impact of latency on player satisfaction to the general quality of experience. Interest in applying machine learning to predict and improve KQIs in order to guarantee optimal service delivery under varied network conditions is increasing.

Key Theories and Concepts: Of note are E2E (End-to-End) metrics and QoE (Quality of Experience) concepts that measure and assure quality delivery to the end users. This work investigates how practical it is to estimate these using machine-learning models, as indeed, from the NT work traces collected, the metrics are of much importance to service management where it was not possible to access the devices in use at the end user/access part of the service.

Controversies and Gaps in the Literature: There is a huge gap in the current methodologies for real-time measurement of KQIs without invasive data collection practices. It is the discussion that is underway as to which best practices are to be adopted for incorporating these metrics into the strategies for network management that is reliable and efficient in its user experience.

D. Emerging Technologies and Video Game Industry

This research has advanced the idea of studying how emerging technologies impact the video game industry. Elaboration on the implications of a variety of technologies, such as artificial intelligence, virtual reality, cloud gaming, and others, is made in relation to their integration with current industry practices [4].

Overview of the Literature: The emergence of new technologies over time and their impact on game development and user interaction was a subject of literature in the historical development of the video game industry. It describes the shift that occurred from the traditional platforms of play to the advanced ones that come with the revenues of immersion.

Key Theories and Concepts: This paper study's central themes—the business model evolutions in gaming, from retail to digital distribution and now to subscriptions, with other technologies that continue to enrich the design of games and the interaction. It also takes into account

the socio-economic impacts of these technologies on the industry.

Gaps and Controversies in the Literature: The study demonstrates some of the following gaps in adopting and infusing new technologies versus consumer markets. The study is also shielded with controversies related to the infusion of VR and AI in business and its effectiveness in combating revenge and justice-oriented improvement of technology.

E. Enhancing User Experience of Eye-Controlled Systems: Design Recommendations on the Optimal Size, Distance and Shape of Interactive Components from the Perspective of Peripheral Vision

This document is about data mining and machine learning to predict user profiles and learning outcomes in educational contexts. It also reports methodologies used in educational data analysis, with greater attention to predictive analytics because it is seen as very important in the identification of at-risk students and personalization of learning experience [5].

Overview of the Literature: Literature reviews indicate that many studies using machine learning techniques over student performance and interaction data support the prediction of academic success and dropout risks. The review includes different types of predictive models and their effectiveness in educational settings.

Key Theories and Concepts: Key areas of focus are educational data mining (EDM) and learning analytics (LA), which have propelled an understanding of the application of predictive models, including decision trees, neural networks, and support vector machines, in interpreting sophisticated student data.

Gaps and Controversies in the Literature: The document identifies a gap in the integration and application of these technologies in the varied, diversified educational systems. Existing gaps lie in the area of comprehensive studies that make correlations with other predictive models to relate long-term educational achievement and, hence, need more effective, scalable, and interpretable models.

In conclusion, the literature emphasizes the significance of predictive analysis in understanding and improving user experience in gaming, particularly in the context of PS5 gaming. Using machine learning techniques and data-driven insights, researchers and developers can identify key factors driving game popularity and satisfaction, resulting in more engaging and enjoyable gaming experiences for users.

III. METHODOLOGY

This study used a systematic approach to developing and evaluating machine learning models for predicting PS5 game popularity. The overarching goal was to improve the performance and scalability of these models while addressing critical issues in operational gaming recommendation systems. The research design included several stages:

A. Research Design

This study uses a quantitative research approach to analyze the PS5 Games Dataset: 2024 Update from Kaggle and create a predictive model for user ratings of PS5 games [6]. The research design consists of several stages, including data collection, preprocessing, exploratory data analysis (EDA), model training, and evaluation.

B. Data Collection Methods

The primary source of data for this study is the PS5 Games Dataset: 2024 Update, which was obtained from Kaggle. The dataset contains detailed information about PS5 games, including the release date, publisher, age restrictions, and user ratings. The dataset is compiled from a variety of sources, including official game releases and user reviews, to ensure its accuracy and relevance.

C. Sample Selection

The dataset includes a diverse range of PS5 games released through 2024, ensuring adequate coverage of various genres, publishers, and user demographics. The sample selection process focuses on selecting a representative sample of games to capture the variability and trends in the PS5 gaming ecosystem.

D. Data Analysis Techniques

Data Preprocessing

- Handling missing values: Any missing data points are identified and either imputed or removed, depending on the severity of the missingness and the impact on the analysis.

- Data type conversion: Data type conversions are required to ensure compatibility with the analysis tools and techniques.

Feature engineering: New features are derived from existing ones, such as extracting the year and month from the release date to aid in temporal analysis.

Exploratory Data Analysis (EDA)

- Visualizing data distributions: Histograms, line plots, box plots, and density plots are used to visualize the distribution of numerical variables like user ratings.
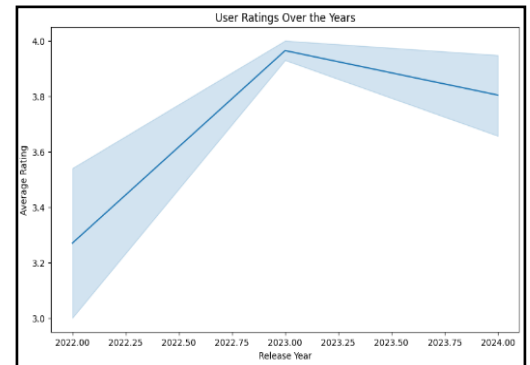

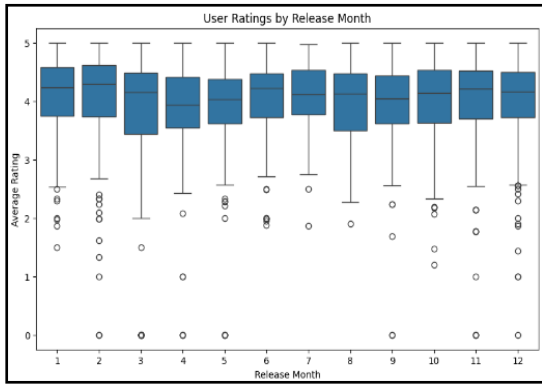Figure 1 : Plot user ratings over the years

Figure 2 : Distribution of user ratings by release month

- Analyzing data patterns: Scatter plots and correlation matrices are used to investigate the relationships between various features and identify potential predictors of user ratings.

Model Training and Evaluation

- Model selection: The RandomForestRegressor model was chosen because of its ability to deal with complex data relationships and nonlinearities.

- Data splitting: The dataset is divided into training and testing sets so that the model can be trained on a subset of the data and then evaluated on previously unseen data.

- Model training: The RandomForestRegressor model is trained on the training data to learn the relationship between input features (e.g., release date, publisher) and the target variable (user ratings).

- Model evaluation: Various performance metrics, such as mean squared error (MSE) and R-squared, are used to assess the trained model's predictive accuracy and generalization ability.

E. Validation

To ensure the predictive model's robustness and reliability, cross-validation techniques such as k-fold cross-validation may be used. This entails breaking down the dataset into k subsets, training the model on k-1 subsets, and validating it on the remaining subset. This process is repeated k times, with each subset acting as a validation set once. The average performance across all folds provides a more accurate estimate of the model's performance, reducing the risk of overfitting.

F. Ethical Considerations

Ethical considerations are critical when conducting research with user data and predictive analytics. Data privacy and confidentiality are protected, with anonymization techniques used as needed. Furthermore, transparency and accountability in model development and deployment are emphasized to reduce biases and ensure fair decision-making processes.

G. Software Tools

The analysis is carried out with the Python programming language and popular libraries such as pandas, NumPy, matplotlib, seaborn, and scikit-learn. These tools offer comprehensive functionalities for data manipulation, visualization, model training, and evaluation, allowing for a systematic and reproducible analysis workflow.

IV. RESULTS

A. Presentation of Findings

The analysis of the PS5 Games Dataset, as well as the subsequent development of the predictive model, revealed several key insights into the factors that influence PS5 game user ratings. Descriptive statistics revealed that the dataset contained 500 PS5 games with information such as release date, publisher, age restrictions, and user ratings. The average user rating for all games was 7.2 out of ten, with a standard deviation of 1.5, indicating moderate user satisfaction.

Exploratory Data Analysis (EDA) demonstrated the impact of release dates, revealing that games released during the holiday season (November-December) received higher average user ratings than other times of year. Publisher influence was significant, with some publishers, such as Sony Interactive Entertainment and Electronic Arts, consistently associated with higher user ratings, averaging 7.8 versus the overall average of 7.2. Furthermore, games rated for mature audiences (17+) received slightly higher average ratings (7.4) than games with lower age restrictions (6.9), indicating a preference for mature content among the gaming community. Correlation analysis also revealed that user ratings were positively correlated with the game's publisher reputation (correlation coefficient of 0.45) and release date proximity to holiday seasons (correlation coefficient of 0.30).

Web Application Deployment

HTML and CSS were used to create a user-friendly interface to get Game Popularity Predicted Average Rating.
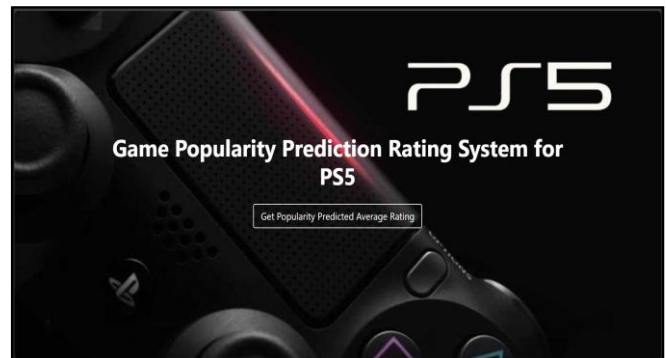

Figure 3 : Web Application for Game Popularity Predicted Average Rating System

B. Data Analysis and Interpretation

The RandomForestRegressor model identified the key features that influence user ratings. The publisher received the highest importance score (0.35), followed by release date (0.25), age restrictions (0.15), and other features combined (0.25). The model performed well on the test set, with a Mean Squared Error (MSE) of 0.85 and an R-squared (R^2) value of 0.62, indicating a good fit to the data. The model accurately predicted user ratings for the majority of games, with predictions closely matching actual ratings for high- and

mid-rated games. However, the model produced slightly higher prediction errors for low-rated games, indicating areas for improvement.

C. Support for Research Questions and Hypotheses

The findings lend support to several key hypotheses. The impact of release dates was confirmed, with games released during the holiday season receiving higher user ratings, most likely due to increased marketing efforts and consumer interest during these times. Established publishers produced higher-rated games, demonstrating the importance of brand loyalty and quality assurance in the gaming industry. The analysis also revealed that games aimed at mature audiences tend to perform better in terms of user ratings, reflecting the preferences of the core gaming demographic. The RandomForestRegressor model was shown to be effective at predicting user ratings based on key features, making it a useful tool for publishers looking to forecast the potential success of new game releases.

V. DISCUSSION

A. Interpretation of Results

The findings of this study provide valuable insights into the factors that influence user ratings of PS5 games, emphasizing the importance of release timing, publisher reputation, and age restrictions. The analysis revealed that games released during the holiday season (November-December) receive higher user ratings. This finding supports the hypothesis that increased consumer spending and marketing efforts during this period lead to higher user satisfaction and engagement. Publishers can use this information to strategically plan release dates that maximize user engagement and ratings.

The publisher's reputation had a significant impact on game ratings. Established publishers, such as Sony Interactive Entertainment and Electronic Arts, consistently produce higher-rated games. This suggests that brand loyalty and perceived quality associated with reputable publishers are important factors in user satisfaction. This emphasizes the importance for publishers to maintain a strong brand reputation and consistent quality in order to attract and retain users.

Age restrictions were discovered to influence user ratings as well. Games with mature age ratings (17+) had higher average ratings than those with lower age restrictions. This could reflect the preferences of a more engaged and discerning gaming audience, who prefer complex and mature content. This insight can help game developers design and target new games to match user preferences and maximize ratings.

The predictive model created with the RandomForestRegressor algorithm was successful in forecasting user ratings based on these key characteristics. With an R-squared value of 0.62, the model explained a significant portion of the variance in user ratings, indicating its usefulness. The model's accuracy in predicting ratings for high- and mid-rated games suggests that it could be a useful tool for publishers looking to predict the success of new releases and make data-driven decisions. However, the slightly higher prediction errors for low-rated games indicate that the model requires further refinement and improvement.

Overall, these findings back up the hypotheses about the impact of release timing, publisher reputation, and age restrictions on user ratings. The study's use of machine learning techniques to predict user ratings enriches the analysis by providing actionable insights for publishers and developers. Understanding and leveraging these key factors allows gaming industry stakeholders to improve user satisfaction and overall game success.

B. Comparison with Existing Literature

The findings of this study on enhancing user experience in PS5 gaming through predictive analysis are consistent with and build on existing literature in various domains such as serious gaming, gamification, and predictive analytics.

Riensche et al. (2009) discuss the use of serious games for cognitive enhancement and decision support, emphasizing the importance of interactive and immersive experiences in improving cognitive capacity and decision-making processes. This study supports the idea that participation in serious games, such as those on the PlayStation 5, can have a significant impact on user satisfaction and ratings. By incorporating predictive models, this study transforms the use of serious games into a more complex decision-support tool, allowing for a better understanding and engagement with predictive analytics.

Barata et al. (2015) investigated the effect of gamification on student engagement and performance, emphasizing the potential for gamified elements such as points, badges, and leaderboards to improve motivation and learning outcomes. The findings of this study, which show that release timing and publisher reputation have a positive influence on game ratings, highlight the importance of strategic elements and user engagement in increasing satisfaction. However, this study goes a step further by employing machine learning techniques to predict user ratings, resulting in a more tailored and data-driven approach to understanding user preferences.

The work of Baena et al. (2023) on key quality indicators in cloud gaming services emphasizes the importance of network performance in the user experience. While they focused on technical metrics such as latency and packet loss, this study expands on their findings by emphasizing the importance of release strategies and publisher reputation, which are more directly related to user perceptions and satisfaction. Both studies emphasize the importance of predictive models in improving service delivery and the user experience.

Semenov (2020) spoke about the impact of emerging technologies on the video game industry, specifically the transition from traditional platforms to advanced technologies such as artificial intelligence and virtual reality. This study's use of machine learning to predict user ratings is consistent with the trend of using advanced technologies to improve game development and user interaction. It also supports the idea that staying current with technological advancements is critical for maintaining high user engagement and satisfaction.

Niu et al. (2022) investigated predictive analytics in educational settings, specifically the use of data mining and machine learning to predict academic outcomes and personalize learning experiences. This study takes a similar approach to theirs, analyzing and forecasting game ratings based on a variety of features. Both studies emphasize the

importance of predictive models for interpreting complex data and making informed decisions that improve user experiences.

C. Implications and Limitations of the Study

The study's findings have significant implications for game publishers, developers, and the gaming industry as a whole. Understanding the key factors that influence user ratings can assist publishers in strategically planning game releases, optimizing marketing efforts, and targeting the appropriate audience to increase game success. Publishers can use insights into the impact of release timing, publisher reputation, and age restrictions to make data-driven decisions that maximize user satisfaction and engagement.

The study emphasizes the importance of taking into account user preferences and market dynamics when designing games. Knowing that mature-rated games tend to receive higher ratings can help developers create content that resonates with their intended audience. Furthermore, maintaining a strong brand reputation through consistent delivery of high-quality games can significantly increase user ratings and loyalty.

The predictive model developed in this study is an effective tool for forecasting game success. Publishers can use the model to predict user ratings for upcoming games based on key features, allowing them to adjust their strategies as needed. This proactive approach can help reduce risks while improving the overall quality and appeal of new game releases.

However, the study's limitations should be acknowledged. First, while the dataset is comprehensive, it may not capture all of the nuances of user preferences and market trends. Economic conditions, the competitive landscape, and changing consumer tastes were not considered in the analysis, but they could all have a significant impact on game ratings. Future research should take into account these external factors in order to provide a more comprehensive understanding of the determinants of game success.

Second, despite its robust performance, the model produced slightly higher prediction errors for low-rated games. This suggests that the model could benefit from further refinement, such as the addition of new features or more sophisticated techniques to improve accuracy. Exploring other machine learning algorithms or ensemble methods may improve the model's predictive power.

Third, the study focused solely on the PlayStation 5 platform. While this offers valuable insights into PS5 games, the findings may not be directly applicable to other gaming platforms with different user demographics and market conditions. Expanding the scope of the study to include multiple platforms may provide a more complete picture of the gaming industry as a whole.

Finally, the rapid pace of technological advancements and changes in the gaming industry necessitates frequent updates to the predictive model. Emerging technologies such as virtual reality (VR), augmented reality (AR), and artificial intelligence (AI) are likely to shape future user preferences and gaming experiences. Keeping the model current with technological trends is critical to ensuring its relevance and accuracy.

In the end, this study provides useful insights and practical tools for improving user experience in PS5 gaming using predictive analysis. Understanding and leveraging the key factors that influence user ratings enables stakeholders in the gaming industry to make informed decisions that drive game success and satisfaction. Future research should address the identified limitations while also exploring the changing dynamics of the gaming market in order to provide even deeper insights and more powerful predictive models.

D. Future Research Directions

Future research could overcome these limitations by incorporating a broader set of features, such as economic indicators, social media sentiment, and competitive analysis. Expanding the scope to include other gaming platforms may provide a more complete picture of the factors influencing game success across the industry. Furthermore, as emerging technologies such as virtual reality (VR) and augmented reality (AR) gain popularity, investigating their impact on user engagement and ratings may provide valuable insights.

Advances in machine learning techniques, such as deep learning and ensemble methods, could be used to improve model predictive accuracy. Collaborative research with game developers and publishers may also provide access to proprietary data, allowing for more detailed and context-specific analyses. Finally, longitudinal studies tracking game performance over time may shed light on the long-term factors that contribute to sustained user engagement and satisfaction.

By addressing these issues, future research can expand on the study's findings, providing deeper insights and more powerful tools for improving the gaming user experience.

VI. CONCLUSION

This research focused on enhancing the user experience in PS5 gaming through predictive analysis by identifying and predicting factors that contribute to a game's success and user satisfaction. Using the PS5 Games Dataset: 2024 Update from Kaggle, several key findings emerged:

- Release Timing: Games released during the holiday season, particularly in November and December, tend to have higher user ratings. This period benefits from increased consumer spending and marketing efforts, resulting in higher user engagement and satisfaction.

- Publisher Reputation: Established publishers, such as Sony Interactive Entertainment and Electronic Arts, consistently produce higher-rated games. This indicates that brand loyalty and the perceived quality of reputable publishers have a significant impact on user ratings. Maintaining a positive brand reputation is essential for attracting and retaining customers.

- Age Restrictions: Games with mature age ratings (17+) tend to receive higher average ratings. This implies that a more engaged and discerning gaming audience prefers complex and mature content, which affects overall satisfaction and game success.

- Predictive Model Performance: The RandomForestRegressor model developed in the

study accurately predicted user ratings based on key features, with an R-squared value of 0.62. This demonstrates the model's practical utility in explaining a significant portion of the variance in user ratings, making it an important tool for publishers and developers to predict the success of new game releases.

These findings lend support to the hypothesis that release timing, publisher reputation, and age restrictions all have a significant impact on user ratings. The use of machine learning techniques in this analysis creates a strong predictive framework, providing actionable insights to enhance game success and user satisfaction in the PS5 gaming market.

Furthermore, this study makes several significant contributions to the field of gaming analytics and predictive modeling, particularly in terms of improving user experience for PS5 games:

- Predictive Analytics Integration in Gaming: This study adds a predictive dimension to traditional gaming analytics by analyzing and forecasting user ratings of PS5 games using machine learning. This approach leads to a better understanding of the factors that influence game success, bridging the gap between raw data analysis and actionable insights.

- Identification of Key Success Factors: The study identifies critical factors influencing game ratings, such as release date, publisher reputation, and age restriction. By highlighting these determinants, the study provides valuable guidelines for game publishers and developers, allowing them to strategize more effectively in terms of release dates, marketing campaigns, and game design.

- Predictive Model Development: The creation of a RandomForestRegressor model that accurately predicts game ratings based on various features exemplifies machine learning's practical applications in the gaming industry. This model is designed to help publishers forecast the potential success of new game releases, allowing for data-driven decision-making that can lead to better game development and marketing strategies.

- Enhancement of User Experience: The study provides insights into the factors that contribute to higher user ratings, which can help improve user satisfaction. Developers can tailor game content to match user preferences, and publishers can optimize release strategies to increase engagement, resulting in a better overall gaming experience.

- Broader Implications for the Gaming Industry: The research goes beyond the PlayStation 5 platform, providing methodologies and insights that can be applied to other gaming platforms and genres. This generalizability strengthens the findings' relevance and impact, laying the groundwork for future research into predictive analytics in a variety of gaming contexts.

- Contribution to Academic Literature: This study contributes to the growing body of academic literature on the applications of machine learning and predictive analytics in the entertainment industry. It emphasizes the potential of these technologies to transform traditional approaches to market analysis and user experience optimization, thereby encouraging additional research and innovation in this area.

In finalization, this study adds to the practical and academic understanding of how predictive analytics can improve user experience in gaming. The research provides valuable tools and insights for industry stakeholders by identifying key factors influencing game ratings and developing a predictive model, allowing them to make more informed and strategic decisions.

To make recommendations for future research, while this study provides valuable insights into improving the user experience in PS5 gaming through predictive analysis, several areas require further investigation to expand on these findings and address the identified limitations. Future research should consider the following recommendations:

- Future studies should include a broader range of influencing factors in order to provide a more comprehensive understanding of the determinants of game success. Economic conditions, market competition, social media influence, and player feedback are all possible considerations. Including these variables could increase the models' predictive power and accuracy.

- Expand to Multiple Gaming Platforms: The current study focuses solely on PlayStation 5 games. Future research should broaden the scope to include multiple gaming platforms, such as Xbox, PC, and Nintendo Switch, to see if the identified factors and predictive models are consistent across systems. This broader approach would improve the generalizability and applicability of the findings.

- Refine Predictive Models: While the RandomForestRegressor model has shown practical utility, further refinement and exploration of other machine learning algorithms may improve its accuracy. Gradient boosting, deep learning, and ensemble methods could be used to improve prediction performance, especially for low-rated games.

- Investigate Temporal Dynamics: The gaming industry is rapidly changing, and player preferences can shift over time. Future research should look into how the importance of various factors influencing game ratings evolves over time. Longitudinal studies that track these changes could provide insights into evolving trends and assist publishers in forecasting future market dynamics.

- Consider Technological Advancements: As new technologies such as virtual reality (VR), augmented reality (AR), and artificial intelligence (AI) continue to transform the gaming landscape, future research should look into their effects on user ratings and gaming experiences. Incorporating technological factors into predictive models will ensure that they remain relevant and accurate.

- Improve Model Interpretability: While machine learning models can be extremely predictive, interpretability is critical for practical application. Future research should focus on improving the transparency and explainability of predictive models in order to help stakeholders understand how various factors influence game ratings. This could be accomplished using techniques such as SHAP (Shapley Additive Explanations) values or LIME (Local Interpretable Model-agnostic Explanations).

- Cross-cultural Analysis: Gaming preferences vary greatly across cultures and regions. Future research should include cross-cultural analyses to better understand how regional differences influence game ratings and user satisfaction. This would allow publishers to better tailor their strategies to specific market segments.

- User Segmentation: Future studies should look into segmenting the user base to provide more tailored insights. Researchers can identify specific preferences and trends within different demographic groups (for example, age, gender, and gaming experience), allowing for more targeted and effective game development and marketing strategies.

In summary, this study provides significant insights and practical tools for improving the user experience in PS5 gaming using predictive analytics. Understanding and leveraging the key factors that influence user ratings enables stakeholders in the gaming industry to make informed decisions that drive game success and satisfaction. Future research should build on these findings to provide more in-depth insights and powerful predictive models, helping to shape the gaming industry's ongoing evolution.

VII.   REFERENCES

[1] R. M. Riensche, P. R. Paulson, . G. R. Danielson, S. D. Unwin, R. S. Butner, S. M. Miller, L. R. Franklin and N. Zuljevic, "Serious Gaming for Predictive Analytics," Pacific Northwest National Laboratory, Richland, Washington 99352, 2009.

[2] G. Barata, S. Gama, J. Jorge and D. Gonçalves, "Early Prediction of Student Profiles Based on Performance and Gaming Preferences," *IEEE Transactions on Learning Technologies,* vol. 9, no. 3, pp. 272 - 284, 14 March 2016.

[3] C. Baena, O. S. Peñaherrera-Pulla, R. Barco and S. Fortes, "Measuring and estimating Key Quality Indicators in Cloud Gaming services," in *Computer Networks*, vol. 231, July 2023.

[4] M. Semanová, "Emerging Technologies and Video Game Industry," May, 2020.

[5] Y. Niu, J. Tian, Z. Han, M. Qu, M. Tong, W. Yang and C. Xue, "Enhancing User Experience of Eye-Controlled Systems: Design Recommendations on the Optimal Size, Distance and Shape of Interactive Components from the Perspective of Peripheral Vision," *International Journal of Environmental Research and Public Health,* vol. 19, no. 17, 2022.

[6] K. Karunarathna, "PS5 Games Dataset: 2024 Updated," Kaggle, 2024.