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DS-GA 1015 Text as Data

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The Role of Specific Features in Enhancing Player Satisfaction in Video Games

Introduction

The growing influence of video games on culture and the economy has sparked significant interest among developers, marketers, and researchers to understand which elements drive player satisfaction. This paper investigates the impact of specific game features like graphics, story, gameplay mechanics, and multiplayer functionality on player experience using a comprehensive dataset of Amazon product reviews. Julian McAuley of UC San Diego meticulously collected, curated, and made these reviews available, offering a rich source of consumer feedback to analyze the attributes correlating with higher customer ratings.

Applying natural language processing and statistical analysis, the paper identifies and quantifies player sentiments across various game features. This study provides actionable insights for developers to prioritize and refine features that resonate most with players, directly informing product design and marketing strategies. Understanding player preferences enables developers to address common criticisms, thereby improving user satisfaction, fostering positive gaming experiences, and enhancing ratings. Ultimately, this research aids in aligning game development and marketing efforts with consumer expectations, supporting strategic business decisions and optimizing the potential for commercial success.

Literature Review

The study of player satisfaction and engagement in video games has drawn significant attention in academic and industry circles, primarily due to its impact on game design and

player retention. Key scholars such as Juho Hamari and Edward Castronova have employed a range of methodological approaches, including gameplay metrics analysis and virtual economy studies, to explore how different game features influence player behavior (Hamari, J., Koivisto, J., & Sarsa, H., 2014; Castronova, E., 2005). Additionally, the use of consumer reviews for sentiment analysis and feature extraction is increasingly popular. Our research extends these methodologies by analyzing sentiment and feature mentions within Amazon game reviews, aiming to link specific game elements with player ratings, thereby offering actionable insights for game development and marketing strategies.

Theory and Hypotheses

H1: Specific game features are positively correlated with higher ratings.

H0: Game features do not have a significant impact on the ratings.

Our research is framed around the hypothesis that specific game features are positively correlated with player satisfaction. We propose that enhancements or superior execution in these aspects of game design significantly elevate player enjoyment and engagement, resulting in higher user ratings on Amazon. This hypothesis is driven by the assumption that certain core elements of a game's design are pivotal in shaping user experiences and satisfaction levels, thereby influencing their review ratings and overall perception of the game.

Conversely, the null hypothesis challenges this assumption by suggesting that these game features do not exert a notable impact on player ratings. By employing natural language processing to perform sentiment analysis and statistical techniques to analyze the correlations, our study aims to rigorously test these hypotheses. We will categorize and quantify the sentiments expressed about different game features within the review texts,

enabling us to evaluate the actual impact of these features on player ratings and to draw nuanced conclusions about the elements that truly enhance player experiences.

Data and Methods

The dataset utilized in this study consists of Amazon video game reviews, compiled and cleaned by Julian McAuley's lab at the University of California, San Diego. Originally containing over 100,000 reviews across a wide spectrum of video games, it provides a representative sample of the gaming community. Duplicate reviews are removed to ensure unique counts, and entries with missing data in critical fields such as review text and ratings are excluded to maintain data integrity.

Reviews containing fewer than 1,000 words are also excluded, focusing the analysis on more detailed feedback. Text preprocessing is conducted using spaCy, an advanced natural language processing tool, which facilitates more than basic tokenization and includes capabilities for parsing and tagging parts of speech for deeper linguistic analysis. Text normalization involves converting all text to lowercase to ensure uniformity. Lemmatization, rather than simpler stemming, is applied to reduce words to their base or dictionary form. Common stop words are removed using spaCy's predefined list to streamline the data for focused analysis.

Exploratory Data Analysis (EDA) involves examining the distribution of ratings and analyzing the length of reviews to determine if longer texts correlate with specific ratings. Sentiment analysis is performed on a subset of reviews to ascertain the prevailing sentiment—positive, negative, or neutral. Visualizations such as histograms or box plots of review lengths and ratings distributions, word clouds of frequently mentioned terms, and

scatter plots to explore correlations between numerical variables are used to provide insights into the data, highlighting significant trends and outliers. (Figure 1)

To further conduct analysis, the overall ratings are transformed into a binary outcome where ratings of 1 to 3 are classified as negative and 4 to 5 as positive, simplifying the analysis and

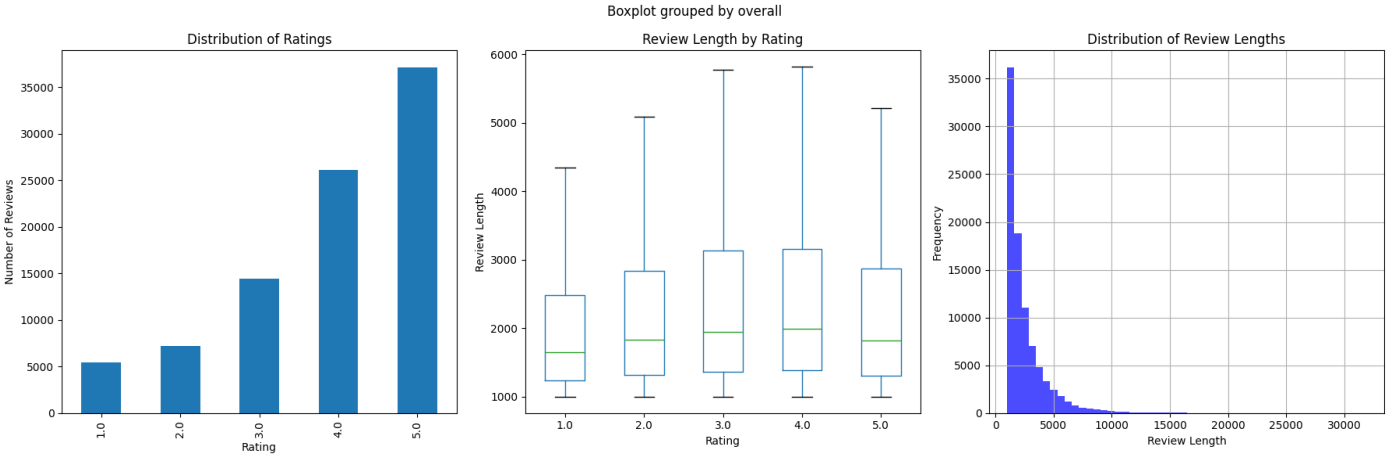

Figure 1

focusing on a clear dichotomy in player satisfaction. This binary transformation is for applying machine learning models that predict player satisfaction based on the presence and sentiment of game features discussed in the reviews. (Figure 2)

Feature analysis within the dataset utilizes two distinct approaches: Latent Semantic Analysis (LSA) and the creation of custom 'informative topics.' LSA serves to reduce the dimensionality of the text data processed through CountVectorizer, revealing latent topics by identifying patterns and thematic groupings not readily apparent from the reviews. This method groups reviews with similar content, organizing the analysis around

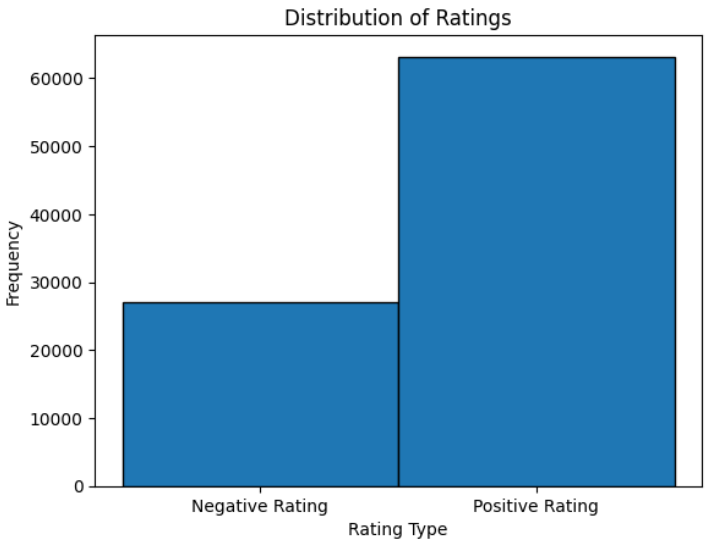

Figure 2

prevalent themes. Building upon this, 'informative topics' are crafted based on a curated set of keywords and phrases that have been identified as significant, sourced from trending keywords within online player communities such as Steam and GameStop. This focused approach concentrates on specific game features often mentioned in player reviews, providing a structured examination of their impact on player satisfaction.

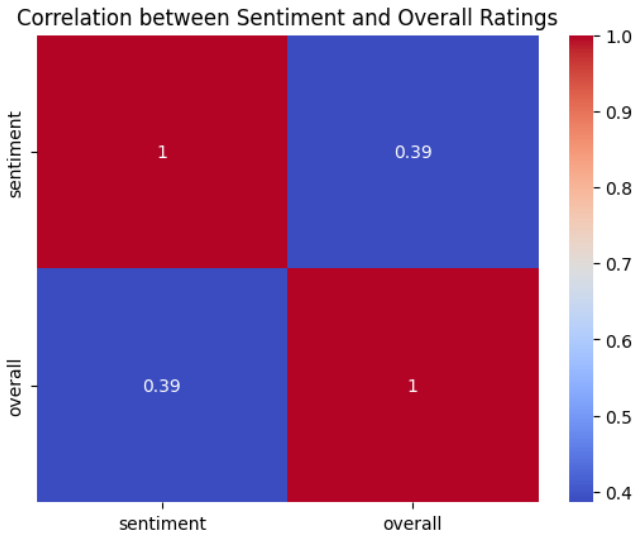

Figure 4

The study advances to assess the relationships between these topics and the overall game ratings. Using Pearson correlation coefficients, the analysis measures the linear relationships among the variables. (Figure 3/ Figure 4) Ordinary Least Squares (OLS) regression is then applied to model these relationships, quantifying how variations in game features, as

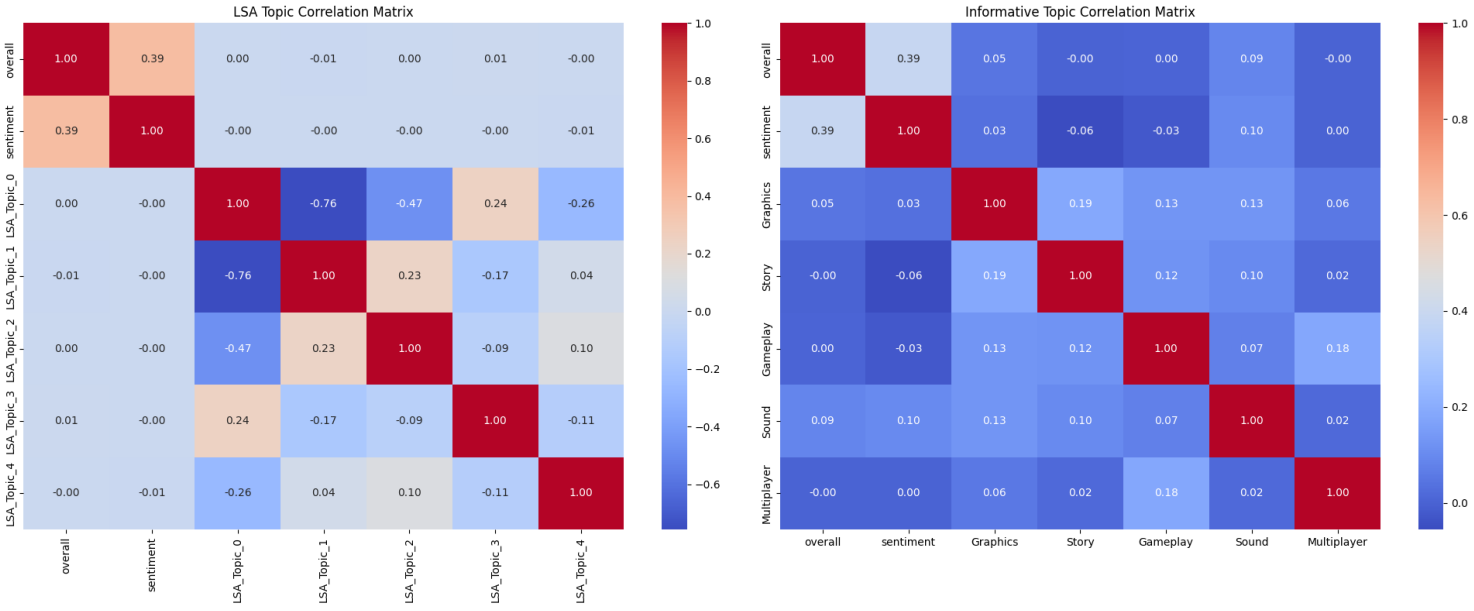

Figure 3

delineated by the review topics, influence player ratings. This regression analysis helps check if there's a statistical link between particular game features and their impact on ratings.

To manage the complexity of the data and enhance predictive accuracy, the script incorporates several advanced machine learning models. A Random Forest model is employed for its robustness and capability to handle complex, non-linear relationships without overfitting. (Figure 5) A Neural Network (NN) is implemented to uncover deeper and more intricate patterns, well-suited for the high-dimensional nature of text data. (Figure 6) Additionally, a Support Vector Classifier (SVC) is used to efficiently categorize levels of player satisfaction, operating by finding the optimal hyperplane that distinguishes between the classes. (Figure 7) These models are applied to predict player satisfaction, enhancing the analytical rigor of the study and providing a comprehensive evaluation of the predictive power of the extracted features.

Results:

The analysis employing Ordinary Least Squares (OLS) regression and machine learning models on the reviews shows that Latent Semantic Analysis (LSA) topics have a negligible effect on player satisfaction, with an R-squared value near zero, indicating these topics alone do not significantly account for variations in player ratings. In contrast, informative topics derived from trending keywords show slightly better explanatory power with an R-squared of 0.008. Specifically, Graphics and Sound topics positively correlate with higher ratings, underscoring their importance in player satisfaction, while the Story topic negatively influences ratings, challenging the assumption that a well-crafted narrative is crucial for all player segments.

Machine learning models, including Random Forest, Neural Network (NN), and Support Vector Classifier (SVC), primarily predict the negative class way more effectively, as evidenced by numerous true negatives in the confusion matrices. The ROC curves for all models show moderate performance with AUC values close to 0.70, yet the precision-recall

curves highlight challenges in maintaining high precision at increased recall levels, likely due to class imbalance and the models' limitations in capturing nuances that influence positive ratings.

These results indicate that the models struggle to accurately predict positive reviews. This misalignment suggests the need for further feature engineering or exploring alternative modeling strategies that better handle data imbalances. The findings highlight that our initial hypothesis, which posited a significant positive correlation of specific game features with high ratings, was not fully supported, particularly for narrative elements. This outcome calls for a reevaluation of game design priorities and suggests that enhancing graphical and sound quality could be more impactful than narrative complexity in driving player satisfaction.

In conclusion, the findings from the OLS regression and machine learning models underscore significant variation in how game features are perceived and their impact on player ratings. Positive correlations of Graphics and Sound with higher ratings, as identified in the OLS analysis for informative topics, reinforce the belief that high-quality visual and auditory elements elevate player satisfaction. This result supports the industry consensus and prior

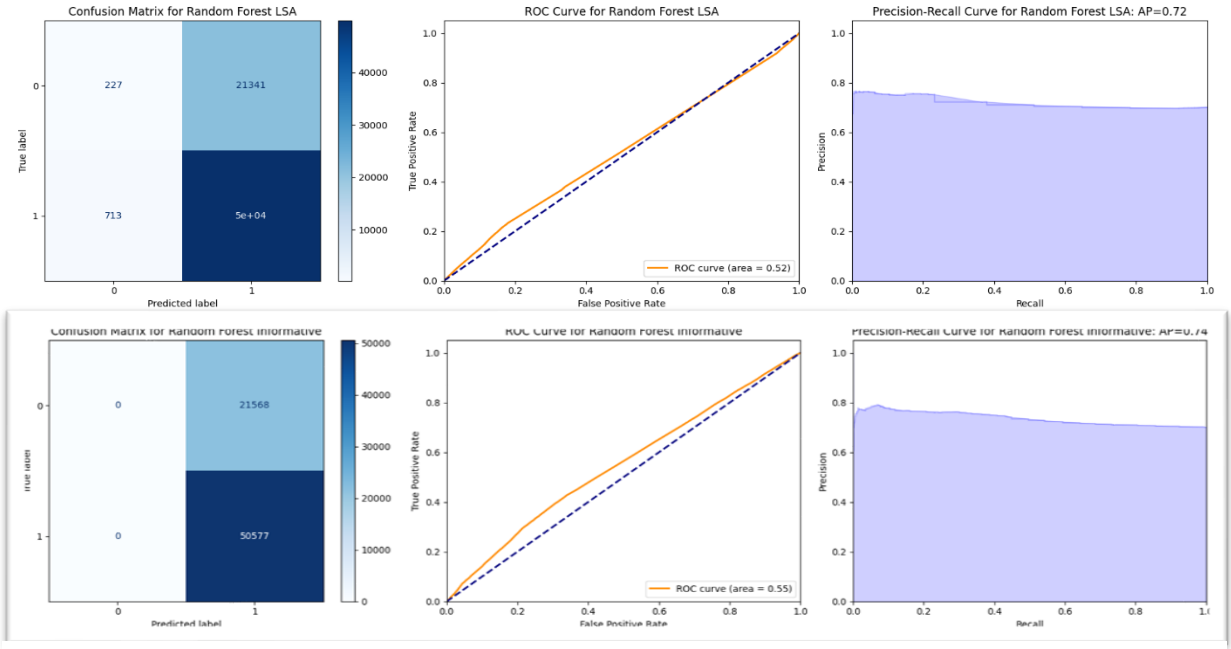

Figure 5

research that superior graphics and sound are key drivers of player engagement and overall experience. However, the negative correlation with the Story topic challenges the assumption that a compelling narrative is universally valued, possibly pointing to divergent preferences among players or suggesting that gameplay mechanics and multiplayer features may outweigh narrative appeal in certain genres. These insights prompt a reconsideration of industry assumptions about which features most contribute to player satisfaction. Additionally, the machine learning models' difficulty in accurately predicting positive reviews reveals potential gaps in feature selection or challenges due to class imbalance. This insight is crucial, as it suggests current predictive models may not fully capture the intricacies that lead to high player satisfaction. Addressing these gaps with more advanced modeling techniques or a more balanced dataset can improve predictive performance and deepen our understanding of player preferences, ultimately helping game developers refine features to optimize player experiences.

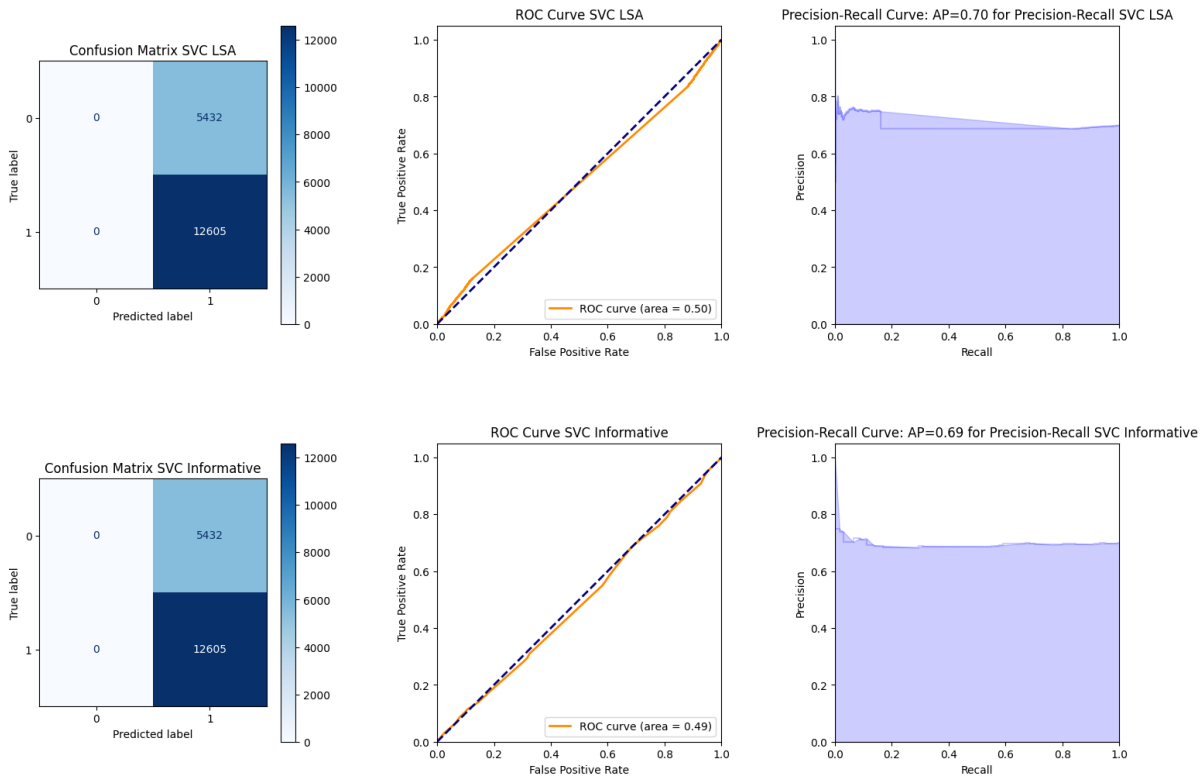

Figure 7

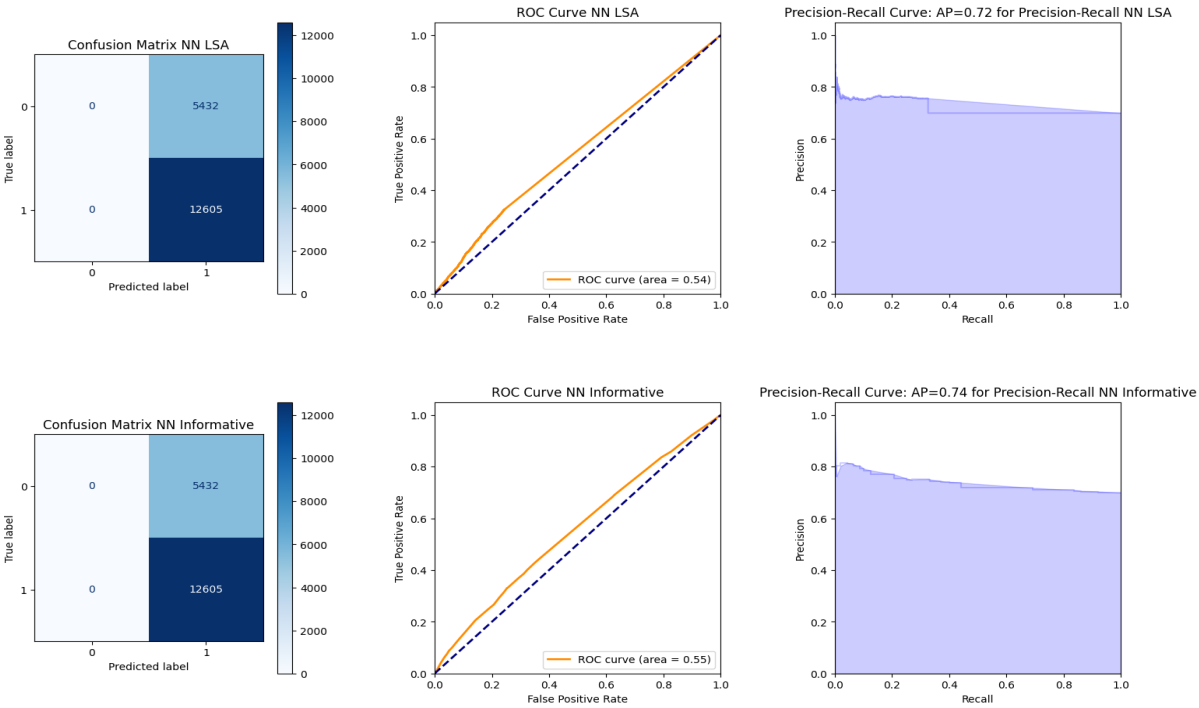

Figure 6

Discussion:

The study's analysis of Amazon video game reviews through OLS regression and machine learning models illuminates the varied impacts of different game features on player ratings. Graphics and sound quality significantly enhance player satisfaction, as evidenced by their positive correlation with higher ratings. This underscores their importance in game development and marketing strategies. Conversely, the complex relationship between narrative quality and player satisfaction, indicated by its negative correlation, challenges prevailing assumptions about the universal appeal of strong storytelling in games. This highlights the need for developers to tailor narrative elements more carefully, considering the specific preferences of different player segments or game genres.

While the findings offer insightful contributions to understanding player preferences, the models faced challenges in accurately predicting positive reviews, suggesting room for

further improvement in feature selection and modeling techniques. Future research should consider integrating more comprehensive datasets, including in-game behavior metrics, and employing advanced machine learning techniques to better handle class imbalances. This research advances the application of data science in analyzing consumer behavior in the gaming industry and also enriches the broader literature by demonstrating how user-generated content can be leveraged to enhance our understanding of media consumption and user engagement.

Biography

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