

Gaming Habits and Psychological Well-being of Gamers

George Mason University
AIT-664-002 | Prof. Dr. Ebrima Ceesay

Manish Chamarajanagar Mahesh
mchamara@gmu.edu

Data Analytics Engineering
George Mason University

Mounish Mani Kumar Mandalapu
mmandala@gmu.edu

Data Analytics Engineering
George Mason University

Nivedita J
nj@gmu.edu

Data Analytics Engineering
George Mason University

Abstract— This study investigates how gaming behaviors and socioeconomic variables can be used by machine learning algorithms to predict psychological well-being. Using a dataset that included metrics like player engagement, game type, frequency of gaming, and socioeconomic backgrounds with information like employment status and educational attainment, we tested several predictive models to see how well they predicted indicators of psychological well-being like life satisfaction and anxiety. According to our research, there is a considerable correlation between specific gaming behaviors and people's psychological states. This suggests that machine learning may provide important clues about how gaming affects mental health. With implications for game designers and mental health researchers alike, the study advances our knowledge of digital habits and their psychological effects.

Keywords— Gaming, Psychological Well-being, Socio-economic Factors, Gaming Addiction, Machine Learning, Gamer Typologies, Behavioral Analysis, Life Satisfaction, Digital Well-being, Gaming Behaviors, Online Social Interaction, Gaming Motivation, Gaming Habits, Social Phobia, Gaming Platforms.

I. INTRODUCTION

In the digital age, gaming has evolved from a simple form of amusement to a daily necessity for millions of people worldwide, becoming interwoven with contemporary society. As the gaming business grows, more and more research is being done on the effects it has on several facets of human existence, including psychological well-being. Understanding the possible impacts of gaming habits on mental health can be facilitated by examining the interaction between gaming behaviors and socio-economic characteristics. This study uses machine learning methods to explore the depths of this relationship with the goal of predicting

psychological well-being using a large dataset that includes socioeconomic factors and gaming behaviors.

Researchers first started examining the effects of video games on emotions, cognition, and social interaction in the early 2000s, which is when interest in the psychological consequences of gaming began to grow. At first, the emphasis was mostly on the bad effects, such as addiction and heightened hostility. A more balanced perspective has now evolved, pointing out that gaming can also be beneficial for social connection, emotional control, and cognitive abilities. This dichotomy has led to a more fair analysis of gaming as a sophisticated pastime with a variety of potential effects on psychological well-being.

Machine learning is being used more and more in modern research as a potent tool to examine and forecast human behavior, including gaming. Because machine learning can manage big datasets and find connections that human researchers would not see right away, it is especially useful for researching the complex linkages between gaming habits and psychological effects. This study makes use of these skills by utilizing a dataset that includes socioeconomic characteristics including age, gender, work position, and educational attainment together with measurements of gaming frequency, kind of games played, length of gaming sessions, and platforms used.

The continuous discussion regarding the effects of gaming in the gaming and psychology communities highlights the importance of this study. While some contend that gaming can cause social isolation and anxiety, others contend that it can improve social relationships and reduce stress. The dataset utilized in this study offers a singular chance to investigate these opposing viewpoints and sheds light on the ways in which distinct gaming behavior patterns are connected

to a range of psychological well-being factors, such as anxiety and life satisfaction.

Furthermore, a more comprehensive understanding of the ways in which people's backgrounds affect their gaming habits and mental health is made possible by the socioeconomic dimensions contained in the dataset. For example, a person's employment situation may have an impact on how much time they can spend gaming, which may have an impact on their psychological well-being and social contacts. Similarly, a person's level of education may influence the games they play and how they play them, which may have an impact on their mental health.

Given the rise in mental health disorders worldwide and the growing appeal of gaming as a recreational activity, this research is especially pertinent. This study is to contribute to the creation of guidelines for healthy gaming practices and to inform interventions that could lessen the detrimental effects of unhealthy gaming behaviors by identifying the connections between gaming habits and psychological well-being.

In terms of methodology, the dataset is analyzed by this study using a range of machine learning models. These models were selected because they can efficiently handle the amount and complexity of the dataset, guaranteeing the reliability and correctness of the results. Finding important determinants of psychological well-being will be the main goal of the analysis, which will also test different models to see which one fits the data the best.

This research has a wide range of consequences. Understanding the link between gaming and psychological health could help politicians create rules and recommendations that encourage responsible gaming. The findings of this study may help the gaming industry create more games that promote mental health and wellbeing. Lastly, by focusing on gaming behaviors that are connected to psychological effects, the findings may open new therapeutic and intervention options for the psychological community.

The Usages and Gratifications Theory (UGT), which contends that people consciously select media sources that satisfy their requirements, such as amusement, social engagement, or escape, is a common theoretical premise used to explain the psychological effects of gaming. When it comes to gaming, this idea can be used to explain the many effects that gaming has on psychological health. For example, some people use gaming as a coping technique, using escapism to escape from real-world stressors, while others use it to build social bonds and improve emotions of belonging and self-worth through cooperative and multiplayer gaming.

But not every effect of gaming is advantageous. According to the Dependency Theory, media addiction can result from excessive consumption, and in certain situations, this might take the form of compulsive gaming behavior despite negative outcomes. This theory is consistent with the results of other research that have shown the detrimental effects of problematic gaming, such as decreased life satisfaction, heightened anxiety, and harmed social relationships.

The results of empirical research on the psychological consequences of gaming have been inconsistent. For instance, a 2019 study by Von der Heiden et al. found a favorable correlation between psychological functioning and moderate video gaming, indicating that gaming can improve emotional and cognitive capacities. On the other hand, a study by Shouman et al. (2023) underlined the possible consequences of excessive gaming by finding a substantial association between internet gaming disorder and lower psychological well-being among university students.

Empirical studies on the psychological effects of gaming have yielded mixed results. For example, a 2019 study by Von der Heiden et al. discovered that moderate video gaming and psychological functioning correlated favorably, suggesting that gaming can enhance emotional and cognitive abilities. However, a study by Shouman et al. (2023) highlighted the potential negative effects of excessive gaming by discovering a strong correlation between university students' psychological well-being and internet gaming disorder.

Even though a plethora of studies has connected gaming to psychological consequences, little is known about how socioeconomic factors affect these impacts. Few research has thoroughly examined the ways in which gaming behaviors combine with factors including economic background, education level, and employment position to affect psychological well-being. Furthermore, more predictive analytics are required to forecast mental health outcomes based on an extensive range of variables, in addition to describing these associations.

By using cutting-edge machine learning algorithms on a dataset that contains comprehensive data on gaming behaviors, socioeconomic characteristics, and psychological well-being measurements, the current study seeks to close these gaps. This methodology will facilitate a comprehensive examination of the intricate relationships among these variables and will allow for the pinpointing of particular risk and protective factors related to gaming.

Numerous contributions to the realm of behavioral and psychological sciences are anticipated from this research. This work could influence the creation of guidelines for responsible gaming and provide

information for more focused mental health therapies by using machine learning to investigate the predictive links between gaming habits and mental health. Furthermore, by offering empirical data to guide public health and digital health policy and practice, it will contribute to the scholarly conversation on the effects of digital technologies on mental health.

In conclusion, this study offers a fresh perspective on how digital behaviors affect mental health by straddling the boundaries of gaming, psychology, and machine learning. This project intends to shed light on the psychological effects of gaming by using machine learning to evaluate big and complicated datasets. By doing so, it hopes to provide important insights that could help both people and society.

It will be critical to keep an open mind about the complex effects of gaming as research develops and to acknowledge both its possible drawbacks and advantages. This study aims to improve both the scientific understanding and the practical management of gaming in modern society by providing a balanced viewpoint to the ongoing discussion about gaming and psychological well-being through rigorous analysis and careful interpretation.

II. RELATED WORK

Research on the relationship between gaming behaviors and psychological health has been ongoing for several decades. With the growing popularity of video games, academics have directed more of their attention toward comprehending the effects of gaming on mental health. This review of the literature looks at earlier research that looked at the connection between gaming habits, socioeconomic status, and psychological health to place this study in the larger framework of new developments in the use of machine learning in behavioral analysis.

It is commonly known that gaming has a twofold effect on mental health. Early studies frequently emphasized the detrimental effects of excessive gaming, including addiction, social isolation, and heightened hostility (Anderson & Dill, 2000). Recent research, however, has started to present a more nuanced picture. Granic et al. (2014), for example, contend that gaming can strengthen social ties, foster emotional resilience, and increase cognitive abilities. They also claim that the type and context of gaming have a big impact on these benefits.

There has been a lot of research done on how socioeconomic issues affect gamers' habits. According to research, preferences and frequency of gaming are influenced by variables like age, gender, and employment position (Nagygyörgy et al., 2013). Finserås et al. (2020) investigated the relationships

between several gamer typologies—which differ based on socioeconomic status—and various mental health consequences. Their findings emphasize the significance of taking these variables into account when doing research on gaming and wellbeing.

The use of machine learning to forecast psychological states from behavioral data is a relatively young field of study that is expanding quickly. Because machine learning can handle big and complicated datasets, it is especially useful for examining the intricate and nuanced correlations that exist between different causes and psychological consequences. Akhter (2018) demonstrated the usefulness of machine learning techniques in behavioral prediction by accurately predicting probable online gambling addicts.

Furthermore, by using machine learning to forecast online gaming addiction in Bangladesh, Islam et al. (2022) shed light on the predictive potential of behavioral data when examined using sophisticated algorithms. These papers highlight how machine learning can provide new perspectives on the psychological effects of digital habits.

III. THE PRIMARY PROCESS EXPLAINED

This study started with the careful collecting and processing of data, which is essential to any machine learning analysis's correctness and dependability. Our dataset included a wide range of variables that captured socio-economic characteristics like age, gender, education, and work position together with specific aspects of gaming habits including the kind of games played, length of gaming sessions, and gaming platforms used. This information was obtained using questionnaires that were posted on different social media sites and gaming forums, guaranteeing a representative and varied sample of the gaming community. The data received extensive preprocessing before analysis, which included cleaning, managing missing values, and normalization to get it ready for the machine learning processes that followed.

Feature selection was the next critical step after data preparation. The goal of this phase was to determine which of the gathered variables most significantly predicted psychological well-being. By applying methods like correlation analysis and feature importance ranking from preliminary models, we were able to focus on the characteristics that had the strongest associations with psychological well-being measurements, such life satisfaction and anxiety scores. Several machine learning models, such as decision trees, random forests, and support vector machines, were built using the features that were chosen. The models were selected

based on their capacity to manage distinct facets of the data's intricacy, ranging from high-dimensional interactions to non-linear correlations.

To train the model, the data was divided into training and testing sets. The model's predictive power was tested using the testing sets. This method aids in preventing models from being overfit to the data. Cross-validation was used to train the models, which made sure that the validation procedure was reliable and that the model's results accurately represented its capacity to generalize to new, untested data. The efficacy of several models was assessed and contrasted using a range of performance measures, including accuracy, precision, recall, and the area under the receiver operating characteristic (ROC) curve.

Interpreting the model outputs to gain understanding of the connections between gaming behaviors, socioeconomic variables, and psychological well-being was the last phase of the main procedure. The models revealed important predictors and their relative importance, and they offered a quantitative framework for forecasting psychological states from gaming activities. These findings are important because they provide scientific basis for focused therapies by pointing to plausible mechanisms through which gaming affects mental health. Higher anxiety levels linked to competitive gaming, for example, may alert legislators and developers to the need for measures that reduce stress in gaming situations. The research's wider implications encompass improving digital game design and influencing regulations to promote a healthier gaming culture, ultimately leading to improved psychological consequences for gamers worldwide.

IV. DATASET

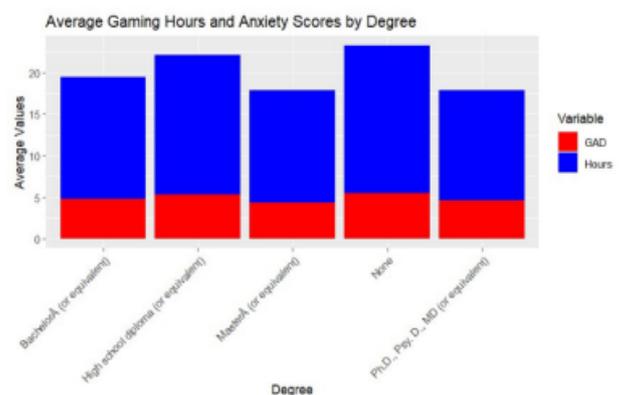
The study's dataset offers a rich combination of factors that were gathered from a wide range of video game players. Using an extensive survey, it includes thorough records on the gaming habits of participants, including the kinds of games played, the platforms used (e.g., PC, consoles), and the amount of time spent gaming. It also includes a wide range of socioeconomic characteristics, such as age, gender, work position, and level of education. A multidimensional assessment of mental health is provided by the Generalized Anxiety Disorder scale (GAD), the Satisfaction with Life Scale (SWL), and the Social Phobia Inventory (SPIN), which are used to measure psychological well-being.

An online survey that was disseminated throughout several gaming forums, social media sites, and email newsletters intended for gamers was used to collect data. By capturing a wide range of demographics and game habits, this approach guaranteed a broad reach throughout the gaming community. In addition to

providing answers on the psychological scales, participants were asked for specific details regarding their gaming preferences and socioeconomic status. Since the poll was meant to be anonymous, accurate and truthful answers were encouraged. More than 10,000 completed surveys made up the final dataset, which offered a solid foundation for statistical analysis and model training.

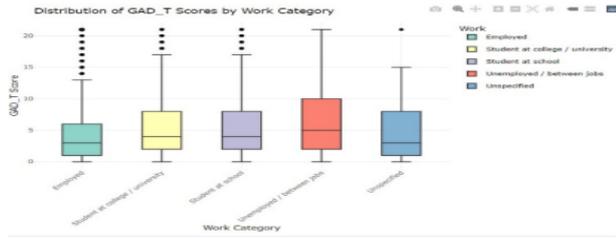
To guarantee data quality and integrity, the dataset underwent extensive preprocessing before analysis. This required dealing with outliers that might distort the data, eliminating incomplete responses, and fixing mistakes. The continuous variables were all normalized to have a uniform scale, and the categorical data were encoded into numerical representations appropriate for machine learning techniques. Special consideration was made to validating replies and standardizing the data to mitigate the sensitive nature of psychological data as well as any biases in self-reported information. The cleaned dataset improves the validity of the conclusions drawn from this investigation while also offering a strong basis for the analyses.

Figure 1



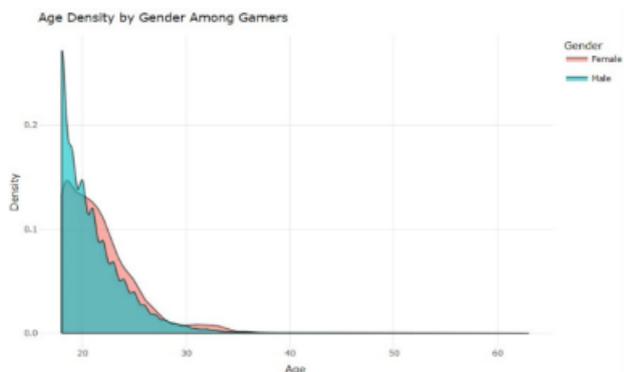
This bar chart illustrates the relationship between educational attainment and both average gaming hours and anxiety scores (GAD). Each educational category, ranging from high school graduate to professional or doctoral degree, is represented with dual-layered bars showing the distribution of gaming hours (blue) atop anxiety scores (red). Notably, the anxiety levels appear relatively consistent across all educational degrees, suggesting minimal variation in psychological impact by educational attainment. Conversely, the gaming hours are slightly varied, indicating a potential trend where educational level might influence gaming behavior. This visualization highlights the interplay between education, gaming habits, and mental health outcomes.

Figure 2



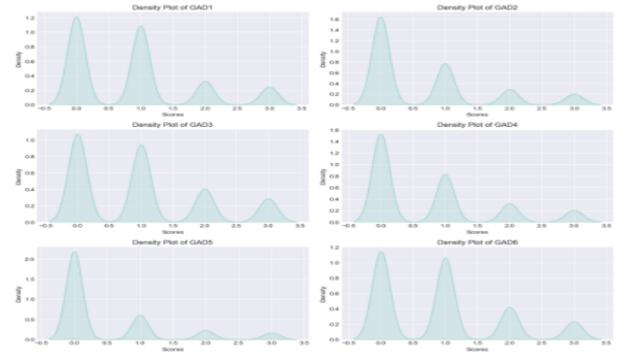
This box plot displays the distribution of Generalized Anxiety Disorder (GAD) scores across different work categories: Employed, Student at school/university, Unemployed/between jobs, and Unspecified. Each category's box plot shows median anxiety levels and the spread of scores, from the lower to upper quartiles. Notably, those categorized as Unemployed/between jobs exhibit a slightly higher median anxiety score compared to other groups, along with a wider interquartile range, indicating greater variability in their anxiety levels. The plot also reveals several outliers, particularly in the Unemployed/between jobs category, suggesting extreme cases of anxiety that deviate from the norm within this group.

Figure 3



This density plot illustrates the age distribution of gamers by gender, showing a comparison between male (blue) and female (red) gamers. Both distributions peak sharply for younger gamers, particularly in the early 20s, indicating a high concentration of young adults in the gaming community. The plot reveals that the density of male gamers extends slightly older than that of female gamers, suggesting a broader age range among males. Additionally, the decline in density beyond the peak is steeper for females, indicating a faster drop-off in gaming participation as age increases among female gamers compared to their male counterparts.

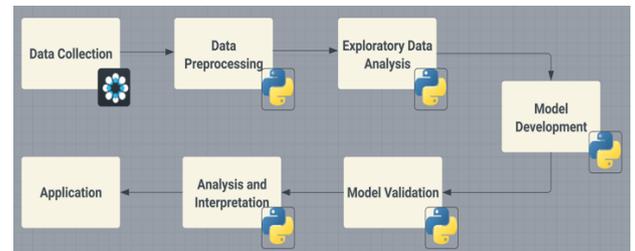
Figure 4



These density plots represent the distribution of scores for six different items of the Generalized Anxiety Disorder (GAD) scale across a sample of participants. Each plot showcases the probability density of scores ranging from 0 to 3, where higher scores indicate increased symptoms of anxiety. The multiple peaks in these plots suggest variations in how respondents experience specific anxiety symptoms, with certain items showing a more pronounced skew towards lower anxiety symptoms (scores closer to 0), while others display more variability with significant densities at higher scores. This visualization aids in understanding the prevalence and intensity of specific anxiety symptoms among the surveyed population.

V. HIGHER-LEVEL FRAMEWORK

Figure 5



Python is a leading tool in the field of data science because of its adaptability, readability, and strong ecosystem of libraries and frameworks. From early data preprocessing to exploratory data analysis (EDA) and, ultimately, to the implementation of machine learning models, this research effort has made extensive use of Python. Python's libraries—which include Scikit-learn for machine learning, Matplotlib and Seaborn for data visualization, and Pandas for data manipulation—have all been essential. These technologies are essential for addressing the complexity of big datasets, facilitating the data transformation, cleaning, and analysis procedures in an effective manner.

Preparing the data is an essential first step in any data science workflow, particularly when working with intricate and diverse datasets as the ones utilized in this study. The Pandas package for Python offers a wide range of data cleaning features, including the ability to handle missing values, remove noise, and normalize data. For example, Pandas makes it simple to identify and impute missing data, so guaranteeing the analysis's robustness. Furthermore, the NumPy module for Python facilitates numerical operations on arrays, which are necessary for feature modification and scaling, which gets the dataset ready for predictive modeling.

EDA, or exploratory data analysis, is essential to comprehending the underlying relationships and patterns in data. Libraries like Matplotlib and Seaborn, which enable the construction of educational visuals like histograms, box plots, and scatter plots, help Python enable EDA. The distribution, trends, and anomalies in the data can be found with the aid of these visual aids, which is helpful for feature selection and hypothesis testing. The insights into the data that were gained from the visualizations created at this phase helped to direct the modeling work that followed.

The use of machine learning models, carried out with Python's Scikit-learn module, represented the pinnacle of the data science process in this project. With a consistent interface, Scikit-learn provides an extensive library of algorithms for supervised and unsupervised learning. The thorough examination and validation of the models was made possible by the library's capabilities for cross-validation, model selection, and assessment metrics, which guaranteed the precision and dependability of the results. Python's well-organized and integrated environment has been invaluable in overseeing this research project's whole lifecycle, demonstrating its capacity to accommodate complex data analysis and modeling methods that are at the heart of contemporary psychology research.

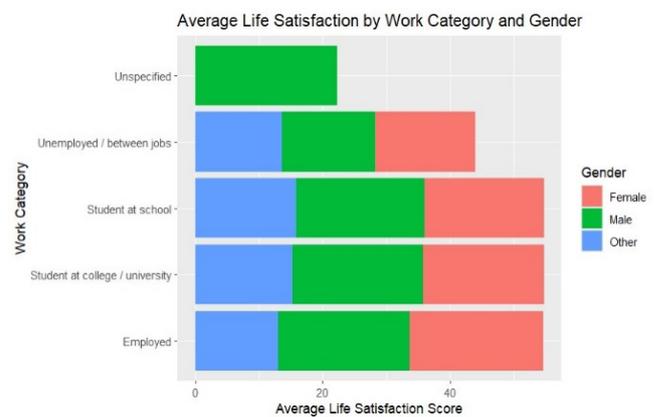
VI. PRELIMINARY ANALYSIS

This study project's main analysis was on examining the intricate connections among gaming behaviors, socioeconomic variables, and psychological health. First, descriptive statistics were used to give a general overview of the data using Python for statistical analysis. This included the means, medians, and standard deviations of each variable. The next step was to perform correlation studies to find important connections between the variables. This played a crucial role in identifying the variables that most closely correlate with psychological outcomes like life satisfaction and anxiety. These correlations were

elucidated by means of the perceptive visualizations produced by Matplotlib and Seaborn, which facilitated the efficient communication of intricate statistical concepts and conclusions.

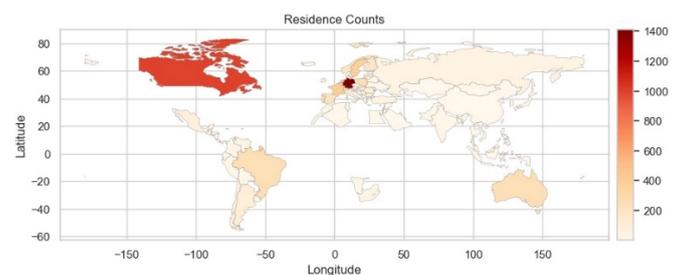
Following the exploratory study, more sophisticated analytical methods were used to further investigate the dataset's predictive power. Based on identified significant variables, machine learning models constructed using Scikit-learn were utilized to predict psychological well-being levels. AUC, F1 score, accuracy, and gradient boosting were among the performance metrics used to assess models including logistic regression, random forests, and gradient boosting. This method not only made it possible to evaluate which models best reflected the subtleties of the data, but it also made it easier to comprehend how many facets of a gamer's lifestyle and socioeconomic status might affect their mental health. These results are crucial for creating focused interventions meant to enhance psychological outcomes for the gaming community.

Figure 6



This bar chart compares the average life satisfaction scores across different employment categories and genders. It shows how life satisfaction varies not only between those who are employed, unemployed, students, or in unspecified categories but also across gender lines within these categories. Such insights are crucial for understanding the socio-economic factors that might influence well-being, informing more tailored interventions in mental health and social policy.

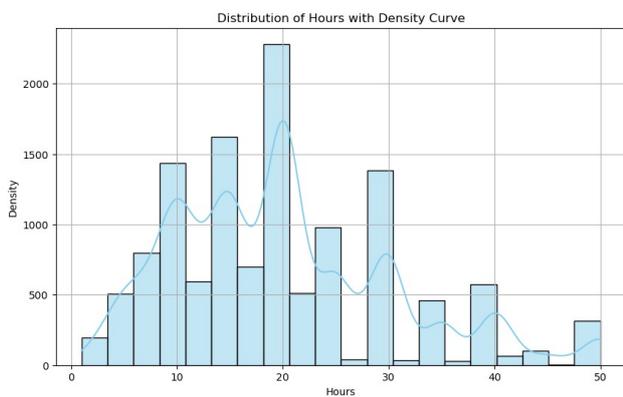
Figure 7



This geographic distribution map shows where participants of the study reside, with a color gradient indicating the density of participants from different regions. Most responses come from North America and Europe, which suggests a geographical focus in the sample. This distribution is vital for contextualizing the findings within specific cultural and regional settings, possibly influencing gaming behaviors and their psychological impacts.

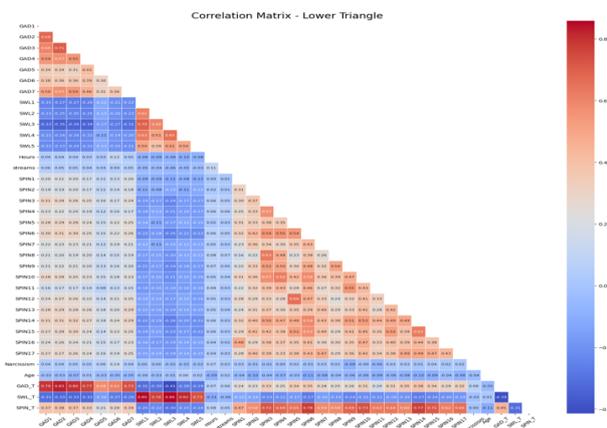
and negative (blue) correlations. This matrix is a critical tool for identifying relationships between variables, which can guide further analyses, such as factor analysis or machine learning model development, to explore these associations more deeply.

Figure 8



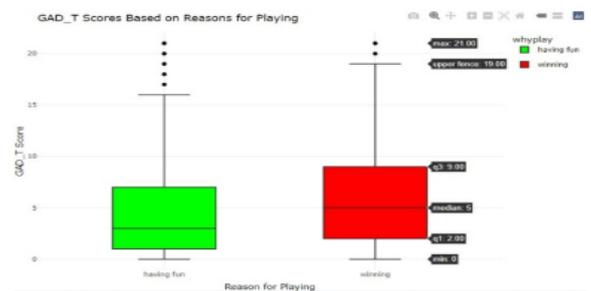
This histogram, overlaid with a density curve, shows the distribution of gaming hours among the study's participants. Most gamers report playing between 10 and 20 hours per week, with the distribution showing a right-skewed pattern. This visualization helps in understanding the typical gaming behavior within the sample and can be used to analyze the relationship between gaming duration and psychological well-being.

Figure 9



The correlation matrix displays the relationship between all variables in the study, including GAD, SWL, SPIN, demographic information, and gaming habits. Each cell in the matrix shows the Pearson correlation coefficient, highlighting both positive (red)

Figure 10



This box plot visualizes the distribution of Generalized Anxiety Disorder (GAD) total scores among gamers based on their reasons for playing: "having fun" and "winning." The green box, representing gamers playing for fun, shows lower median GAD scores and a tighter interquartile range, indicating generally lower anxiety levels. In contrast, the red box, for gamers playing to win, displays higher median GAD scores and a broader range, suggesting higher anxiety levels among these players. The presence of outliers in both categories highlights individuals with extreme scores, which could be important for understanding the psychological impacts of gaming motivations.

In this study, we explored the optimal target variable for analyzing the impact of gaming behaviors and socioeconomic factors on psychological well-being. The candidate variables considered were Total Satisfaction with Life (SWL_T), Generalized Anxiety Disorder Total (GAD_T), and Social Phobia Inventory Total (SPIN_T).

To determine the most appropriate target variable, we conducted both chi-squared and R-squared statistical tests to evaluate the association and explanatory power of each variable with respect to the numerous categorical and numerical attributes in our dataset. The R-squared results indicated varying levels of explanatory power across these metrics, which guided our preliminary evaluation.

Figure 11

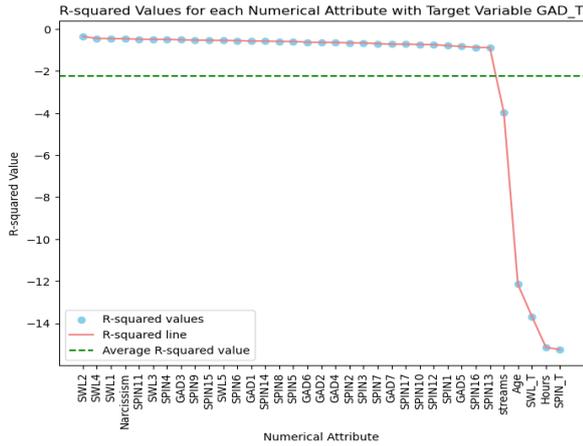


Figure 12

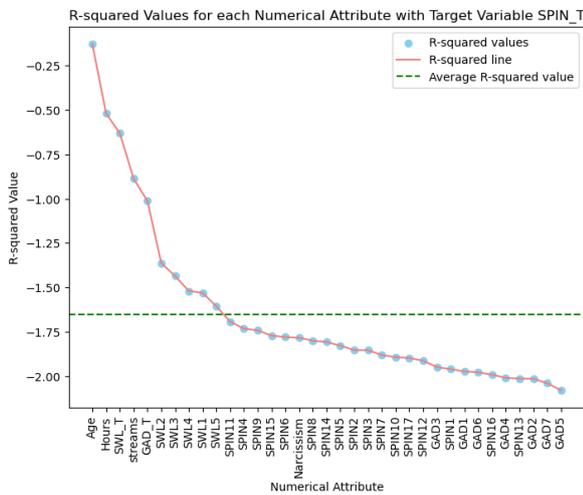
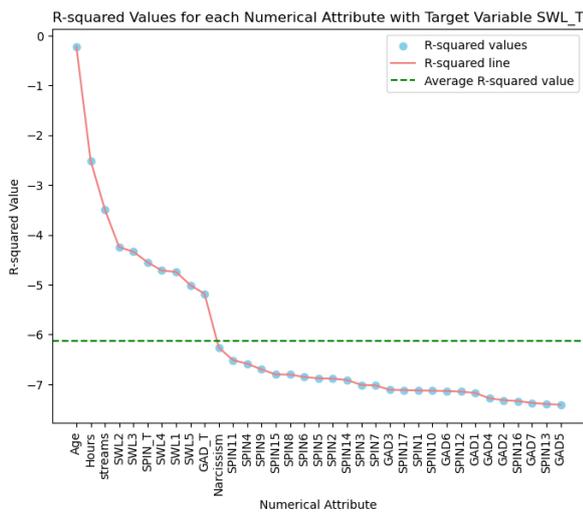


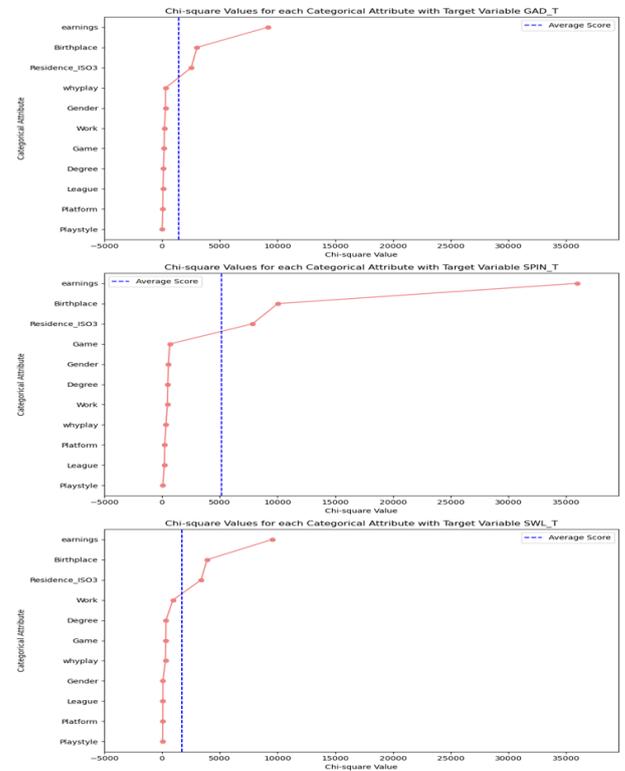
Figure 13



...serving as foundational statistical tools to ascertain the strength and significance of associations between various gaming-related behaviors, socioeconomic factors, and psychological outcomes. The chi-squared test, a non-parametric statistic, is particularly valuable for identifying significant relationships between categorical variables and the potential target variables. By evaluating the independence of categorical attributes from our candidate psychological metrics, this test helps to highlight which factors are most likely to influence psychological states in the gaming context. This is instrumental in ensuring that the variables included in our final models are not only statistically significant but also relevant to the specific nuances of gaming behaviors.

On the other hand, the R-squared test measures the proportion of variance in our dependent psychological variables that can be explained by the independent variables in our models. This metric is essential for assessing the explanatory power of each potential target variable, providing a quantitative basis for selecting the most effective one for predicting psychological outcomes. The higher the R-squared value, the more effectively a variable captures the variations in psychological states attributed to differences in gaming behavior and socioeconomic backgrounds.

Figure 14



The chi-squared and R-squared tests play a crucial role in the methodological framework of our study,

Despite SPIN_T initially appearing as a promising target due to its significant associations in the R-squared analysis, we recognized a potential bias. This bias stemmed from the dataset containing 17 direct contributing SPIN variables, which could artificially inflate the explanatory power of SPIN_T as a total score. Therefore, we reconsidered its suitability as a primary focus.

Our attention then turned to GAD_T. However, further analysis showed suboptimal performance in modeling psychological well-being when using GAD_T alone. To refine our approach, we consulted the clinical interpretation guidelines provided by the University of Washington's Department of Global Health which categorize GAD scores into four distinct levels of anxiety severity:

- Score 0-4: Minimal Anxiety
- Score 5-9: Mild Anxiety
- Score 10-14: Moderate Anxiety
- Score greater than 15: Severe Anxiety

Based on these classifications, we created a new binary variable named 'Anxiety' to serve as our target variable. This variable dichotomizes the GAD_T scores, classifying scores from 0-9 as 'Low Anxiety' (0) and scores 10 and above as 'High Anxiety' (1). This new target variable aims to provide a clearer, clinically relevant categorization that enhances the applicability and interpretability of our models.

Incorporating these statistical tests into our research design allows for a more rigorous and empirically grounded approach to modeling psychological well-being. The application of chi-squared and R-squared tests ensures that our selection of target variables is not only informed by theoretical considerations but is also backed by empirical evidence demonstrating their predictive validity. This dual emphasis on theoretical rationale and statistical validation strengthens the overall robustness of our study, enhancing the reliability of our findings and the conclusions drawn from them.

Furthermore, the insights gained from these tests guide the development of more tailored interventions and policy recommendations. By understanding which variables are most strongly associated with psychological outcomes and how much of the variance in these outcomes they explain, we can design interventions that more precisely address the underlying factors contributing to mental health issues among gamers. This targeted approach not only improves the effectiveness of interventions but also contributes to the broader field of mental health research by providing a detailed understanding of how specific gaming-related behaviors impact psychological well-being.

The decision to adjust the target variable was supported by both the chi-squared and R-squared results, which are documented in the attached figures. These tests provided crucial insights into the relationships between our variables and psychological metrics, ultimately guiding our selection of a more robust and meaningful target variable for investigating the impacts of gaming behaviors on mental health.

VII. DISCUSSION

Three well-known machine learning models were used to analyze psychological well-being based on gaming habits and socioeconomic factors: Random Forest, Gradient Boosting, and Logistic Regression. The findings show that the models perform rather well, with Random Forest scoring 84.88%, Gradient Boosting at roughly 84.57%, and Logistic Regression at roughly 85.01%. According to these findings, all three models may predict psychological well-being quite well, except for Logistic Regression, which did marginally better than the other two. This could be explained by the fact that some of the data's associations are linear, which is consistent with the basic tenets of logistic regression.

Figure 15

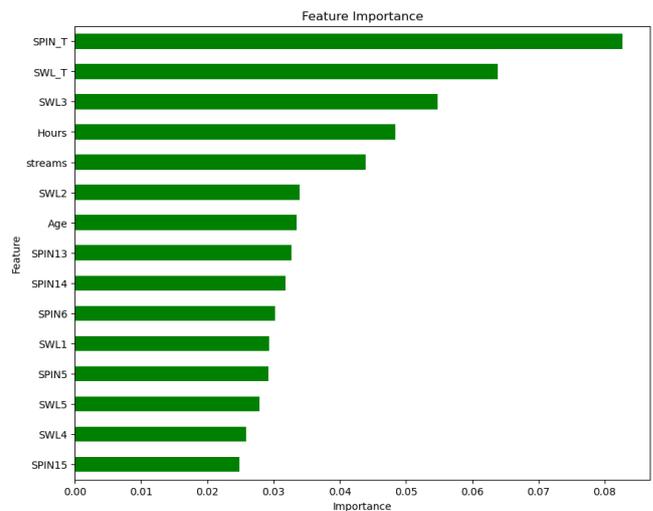


Figure 16

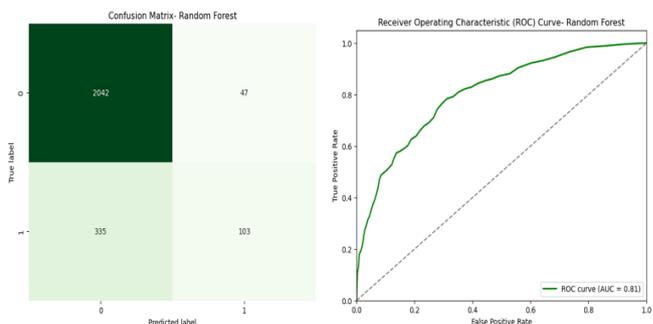


Figure 17

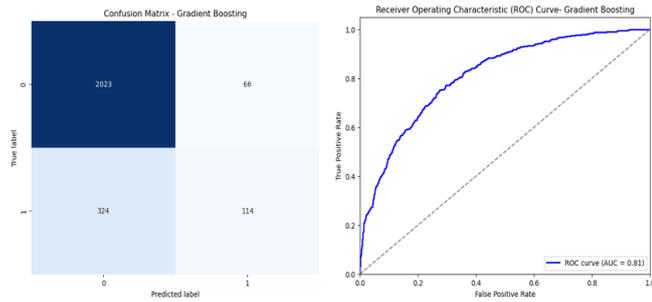
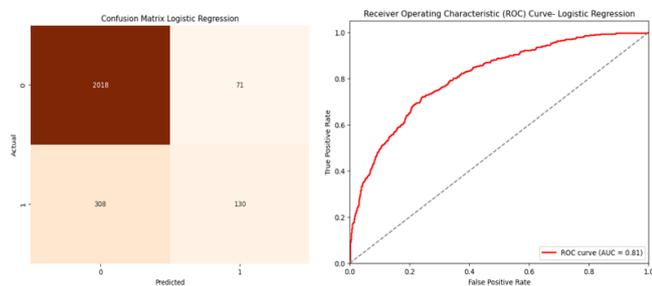


Figure 18



The models' marginally different performances point to various significant features of data-driven predictions in psychological research. First, the predictors selected based on the preliminary exploratory data analysis were found to be robust, as evidenced by their consistency across various model types. This shows that factors including the amount of time spent gaming, the motivations behind the game, and socioeconomic level are powerful predictors of psychological states. Secondly, the better results of Logistic Regression could mean that this dataset's noise and collinearity are better suited for Logistic Regression, or it could mean that the correlations between predictors and psychological well-being are mostly linear.

The results of these models suggest several directions that further study might go. One strategy would involve integrating deeper learning algorithms and other sophisticated machine learning models, such as deep learning models, which may be better able to detect non-linear patterns than Logistic Regression. More specific information about gaming habits, like game genres and in-game actions, should also be included to investigate if these factors help to improve the predictions. Furthermore, broadening the dataset to encompass a more diverse range of demographic and geographic characteristics may improve the overall applicability of the results. More research using experimental or longitudinal designs could investigate the causal linkages suggested by the predictive models and offer

more insight into the long-term effects of gaming on psychological well-being.

This highlights the need for policymakers and game developers to consider these predictive factors when designing interventions or game features aimed at promoting healthier gaming habits. Additionally, the close performance of the three machine learning models—Random Forest, Gradient Boosting, and Logistic Regression—suggests that a combination of these approaches could enhance the robustness and accuracy of predictions in similar studies. Such an integrated approach could potentially lead to more precise interventions tailored to individual needs.

Furthermore, the nuanced understanding of gaming behaviors provided by this study can inform therapeutic approaches that leverage gaming as a medium for mental health interventions. By identifying specific patterns and predictors of well-being, mental health professionals can tailor their strategies to support individuals who may be at risk due to their gaming habits. This could include personalized recommendations for gameplay, balance, and breaks, ensuring that gaming remains a positive activity in the lives of players.

These insights not only enhance our understanding of the relationship between gaming and psychological well-being but also suggest broader applications for these machine learning techniques in public health and policy making.

VIII. ANALYTICAL CONCLUSION

The Random Forest model's feature importance graph provides important information about the factors that most significantly predict gamers' psychological well-being. Notably, the most significant features are the total scores on the Satisfaction With Life Scale (SWL_T) and the Social Phobia Inventory (SPIN_T), highlighting the robust correlation between social phobia, overall mental health, and life satisfaction. This is consistent with psychological theories that highlight the influence of life satisfaction and social interactions on mental health. The amount of time spent gaming is also highly significant, indicating a direct relationship between the amount of time spent gaming and psychological states.

The research also shows that different aspects of the Satisfaction With Life Scale (e.g., SWL2 and SWL3) and particular items from the Social Phobia Inventory (e.g., SPIN13 and SPIN14) are crucial for comprehending the subtleties of how gaming affects mental health. These components highlight the intricate relationship between social anxiety and quality of life evaluations. This relationship is especially pertinent

when it comes to gaming, as social interaction can take many different forms, ranging from intensely social multiplayer settings to solitary gaming sessions.

To sum up, the research's analytical results offer a nuanced perspective on the factors that influence psychological well-being when gaming. The necessity of taking psychological and social elements into account when evaluating the influence of gaming habits is highlighted by the dominance of life satisfaction and social phobia variables. These understandings may be crucial for developing treatments that encourage better gaming habits and enhance players' mental health. Furthermore, the major elements that have been highlighted provide avenues for future study to investigate certain interventions and supports that have the potential to reduce negative effects and improve positive aspects of gaming.

IX. FUTURE WORK

Building on the results of this investigation, future studies should incorporate additional variables that may have an impact on these correlations to fully analyze the intricate linkages between gaming behaviors and psychological well-being. Investigating the effects of game genres, multiplayer versus single-player modes, and in-game achievements are some examples of this, since they may provide further understanding of the elements of gaming that have an impact on mental health. Furthermore, incorporating a wider range of geographic and cultural variety into the dataset might improve the conclusions' generalizability. To address the shortcomings of the cross-sectional methodology employed in this study and evaluate the long-term impact of gaming behaviors on psychological well-being, longitudinal studies might be beneficial.

Applying more advanced machine learning methods, such deep learning, would also be advantageous to capture more intricate, non-linear correlations in the data. These models might make more nuanced patterns visible that the current study's methodologies were unable to pick up on. Incorporating qualitative information through focus groups or player interviews may also assist contextualize the quantitative findings and shed light on the emotional and personal aspects of gaming. Together, these methods would deepen our knowledge of the ways that gaming interacts with different aspects of human psychology and help develop more sensible interventions and regulations to assist gamers' mental health.

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