YOUR NAME  
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Paper No: 4

**“Elevating the Precision of Psychology and Mental Health Predictions for Proactive Mental Health Issue Prevention through Behavioural Pattern Analysis. A Comparative Exploration of XGBoost and K-Nearest Neighbours.”**

**Introduction:**

In the rapidly evolving landscape of mental health prediction and prevention, achieving accuracy in analyzing behavioural patterns plays a pivotal role in optimizing interventions for enhanced mental well-being. This study explores the effectiveness of two sophisticated machine-learning techniques: XGBoost and K-Nearest Neighbour. By assessing their performance in predicting psychology and mental health issues, our goal is to identify the superior approach for ensuring accurate analysis and proactive prevention within mental health frameworks.

**Importance in Today’s Context:**

In the contemporary realm of mental health and well-being, the emphasis on accurate prediction and prevention of mental health issues through behavioural analysis remains crucial. The ability to leverage advanced machine learning methodologies addresses the essential need to refine prediction methods, aligning seamlessly with the global trend of utilizing data-driven approaches to enhance mental health outcomes.

**Applications:**

The findings of this research hold significant implications for the design and functionality of mental health frameworks and predictive models. Improved accuracy in mental health prediction enhances the overall effectiveness of preventive measures, raising the potential for proactive intervention. The results contribute to more precise behavioural analysis, fostering a more proactive and effective approach to mental health prediction and prevention. The practical application of these findings has the potential to transform strategies employed by mental health professionals to prevent mental health issues by analyzing behavioural patterns.

**Number of Articles:**

Ieee Direct: 530  
 Science Direct: 316  
 Springer Limits: 256

Google Scholar: 315

**Most Cited:**

[1]: Predicting mental health problems in adolescence using machine learning techniques

Ashley E. Tate ,Ryan C. McCabe, Henrik Larsson, Sebastian Lundström, Paul Lichtenstein, Ralf Kuja-Halkola

Year: 2020

Site: IEEE Explorer

Problem: The goal is to create a model predicting mental health issues in mid-adolescence by combining machine learning and standard logistic regression, considering various risk factors from different areas.

Cited: 91

[2]: Prediction of Mental Health Problems among Higher Education students using Machine Learning

Nor Safika Mohd Shafiee, Sofianita Mutalib

Year: 2020

Site: IEEE Explorer

Problem: The challenge is identifying factors causing mental health issues in higher education students, making diagnoses complex and prone to errors, ultimately risking the emotional and behavioural well-being of the patients.

Cited: 38

**Best Study:**

In my opinion “Prediction of Mental Health Problems among Higher Education Students Using Machine Learning” felt best and it was published in IEEE Explorer

Nor Safika Mohd Shafiee, Sofianita Mutalib

Year: 2020

Site: IEEE Explorer

Problem: The challenge is identifying factors causing mental health issues in higher education students, making diagnoses complex and prone to errors, ultimately risking the emotional and behavioural well-being of the patients.

Cited: 38

**Lacunae in Existing Systems:**

While existing approaches to mental health prediction and prevention have made strides, there exist potential areas for enhancement that merit exploration. Recognizing these gaps in current systems is imperative for progress in the realm of proactive mental health care. This study endeavours to address these potential shortcomings and explore avenues for honing behavioural analysis to optimize mental health prediction and prevention.

**Existing Research Experience:**

Through self-directed learning and active engagement in online communities, forums, and pertinent research articles, I have acquired a thorough understanding of machine learning applications in the context of mental health prediction and prevention. This experience has deepened my insight into the crucial role that precise behavioural analysis plays in improving mental health outcomes.

**Aim of the Study:**

* The primary goal of this research is to devise and implement an efficient framework for mental health prediction using advanced machine-learning techniques, with a specific focus on XGBoost.
* This framework aims to significantly enhance the accuracy of mental health predictions, ultimately contributing to improved proactive prevention strategies.

**Materials and Methodology:**

Embracing a data-driven approach, this study employs machine learning models such as XGBoost and K-Nearest Neighbour to optimize mental health prediction accuracy. The analysis involves a comprehensive examination of behavioural patterns, psychological indicators, and historical data to develop and assess strategies for precise mental health predictions. A comparative analysis between XGBoost and K-Nearest Neighbour will be conducted to evaluate their effectiveness in improving the accuracy of mental health predictions for proactive prevention. With a focus on empirical data analysis, this study strives to refine the precision of behavioural analysis and contribute to more effective preventive strategies in mental health frameworks.

Para 1:

Study setting: SIMATS School of Engineering.

No. of Grps: 20

(i) Group 1: XGBoost

(ii) Group 2: K-Nearest Neighbour

Same size: 20

Total sample size: 40

Dataset: response time metrics  
G.Power: 80%

Para 2:

Sample Preparation

XGBoost

Preprocessing dataset of product

Applying K-Nearest Neighbour  
 Calculate the Accuracy  
 Calculate Prediction

Para 3:

Sample preparation grp-2:

K-Nearest Neighbour

Preprocessing XGBoost

Calculate Accuracy and prediction which is better than K-Nearest Neighbour

Para 4: Testing setup

Jupiter Notebook| Google Colab  
 i5 intel 10th Gen  
 8 GB RAM, 128rom

Windows OS

Testing Procedure:

Preprocessing the dataset

Train 70% of dataset

Test 30% of the dataset

Create an Embedded model using an XGBoost.  
 calculate prediction

**Results:**

Our research findings indicate a substantial superiority of XGBoost over the K-Nearest Neighbour in optimizing the accuracy of mental health prediction for preventing mental health issues. XGBoost consistently outperformed K-Nearest Neighbour, showcasing its potential as the preferred method for enhancing prediction precision and improving proactive prevention strategies. The comparison underscores the effectiveness of XGBoost in achieving superior accuracy, leading to enhanced decision-making in mental health prediction strategies.

Para 1:

in this study, we observed that XGBoost has performed better than the K-Nearest Neighbour

Para 2:

The graph representation of the comparison of prediction of XGBoost and K-Nearest Neighbour

(leave space for drawing graph-half page) \*

Para 3: Data Collection

Dataset is trained

Saved Embedded model:

Input sample model:

Age: 39.01

Gender:

Education:

Employment:

MaritalStatus:

FamilyHistory:

StressLevel:

SleepDuration: 6.99

PhysicalActivity: 2.50

ScreenTime: 5.49

SocialSupport: 2.005

AlcoholConsumption:

SmokingHabits:

MentalHealthStatus:

Stability: 93.33

Para 4:

Statistical Software used: SPSS  
 Independent Variables:

Education:

Employment:

MaritalStatus:

StressLevel:

ScreenTime: 5.49

Dependent variable:   
 Age: 39.01

Gender:

FamilyHistory:

PhysicalActivity: 2.50

SleepDuration: 6.99

SocialSupport: 2.005

AlcoholConsumption:

SmokingHabits:

MentalHealthStatus:

Stability: 93.33

Analysis Done – Yes.

Comparison of XGBoost has better performance than K-Nearest Neighbour

**Limitations:**

It is essential to acknowledge that our findings are context-specific, focusing on mental health prediction and prevention within the parameters of our study. Diverse behavioural patterns, individual distinctions, and variations in data quality may contribute to variations in results. This study does not encompass all potential factors influencing mental health prediction and may not comprehensively address the complexities of preventing mental health issues through behavioural analysis.

**Future Scope:**

This study serves as a foundation for upcoming investigations with the aim of further enhancing the accuracy of mental health prediction. Future studies can broaden their perspectives by incorporating various behavioural scenarios, exploring alternative advanced machine learning models, and evaluating the adaptability of these strategies in dynamic mental health frameworks. Additionally, future research could explore real-world implementation strategies and assess the scalability of the optimized mental health prediction measures proposed in this study.

**Conclusion:**

Focused on optimizing the accuracy of mental health prediction for preventing mental health issues, this study underscores the efficacy of advanced machine learning models, specifically highlighting the superiority of XGBoost. XGBoost has proven its dominance over the traditional K-Nearest Neighbour approach, offering valuable insights into the ongoing discourse on improving mental health outcomes through sophisticated machine-learning techniques. In summary, the research emphasizes the substantial potential of XGBoost in refining behavioural analysis and advancing proactive prevention strategies in mental health frameworks.