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Paper No: 3

**“Refining the Accuracy of Predictions in Psychology and Mental Health to Mitigate Mental Health Challenges through the Analysis of Behavioural Patterns. A Comparative Study between XGBoost and Long Short-Term Memory Network”**

**Introduction:**

In the swiftly evolving landscape of mental health prediction and prevention, the pursuit of precision in analyzing behavioural patterns is integral for optimizing interventions and promoting enhanced mental well-being. This study delves into the effectiveness of two advanced machine-learning techniques: XGBoost and Long Short-Term Memory Network. The objective is to assess their performance in predicting psychology and mental health issues, aiming to pinpoint the superior approach for accurate analysis and proactive prevention within mental health frameworks.

**Significance in Today’s Context:**

In the contemporary sphere of mental health and well-being, the significance of accurate prediction and prevention of mental health issues through behavioural analysis cannot be overstated. The adoption of advanced machine learning methodologies addresses the fundamental necessity to refine prediction methods, aligning seamlessly with the global trend of incorporating data-driven approaches to elevate mental health outcomes.

**Applications:**

The discoveries from this research carry substantial implications for the structure and functionality of mental health frameworks and predictive models. Enhanced accuracy in mental health prediction amplifies the overall efficacy of preventive measures, opening avenues for proactive intervention. The outcomes contribute to a more refined behavioural analysis, fostering a proactive and effective approach to mental health prediction and prevention. The pragmatic application of these findings holds the potential to revolutionize the strategies employed by mental health professionals in preventing mental health issues through the analysis of 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:**

Despite advancements in current approaches to mental health prediction and prevention, there are areas with the potential for improvement that merit exploration. Identifying and addressing these gaps in existing systems is pivotal for advancing the field of proactive mental health care. This study endeavours to tackle these potential shortcomings and explore pathways to refine behavioural analysis, aiming to optimize mental health prediction and prevention.

**Existing Research Experience:**

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

**Aim of the Study:**

* The principal goal of this research is to devise and execute an efficient framework for mental health prediction utilizing advanced machine-learning techniques, with a specific focus on XGBoost.
* This framework seeks a substantial enhancement in the accuracy of mental health predictions, ultimately contributing to improved proactive prevention strategies.

**Materials and Methodology:**

Adopting a data-driven approach, this study employs machine learning models, including XGBoost and Long Short-Term Memory Network, to optimize mental health prediction accuracy. The analysis involves a thorough examination of behavioural patterns, psychological indicators, and historical data, aiming to develop and assess strategies for precise mental health predictions. A comparative analysis between XGBoost and Long Short-Term Memory Network will be conducted to gauge their effectiveness in improving the accuracy of mental health predictions for proactive prevention. Emphasizing 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: Long Short-Term Memory Network

Same size: 20

Total sample size: 40

Dataset: response time metrics  
G.Power: 80%

Para 2:

Sample Preparation

XGBoost

Preprocessing dataset of product

Applying Long Short-Term Memory Network  
 Calculate the Accuracy  
 Calculate Prediction

Para 3:

Sample preparation grp-2:

Long Short-Term Memory Network

Preprocessing XGBoost

Calculate Accuracy and prediction which is better than Long Short-Term Memory Network

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 Long Short-Term Memory Network in optimizing the accuracy of mental health prediction for preventing mental health issues. XGBoost consistently outperformed Long Short-Term Memory Network, 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 Long Short-Term Memory Network

Para 2:

The graph representation of the comparison of prediction of XGBoost and Long Short-Term Memory Network

(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 Long Short-Term Memory Network

**Limitations:**

It is essential to acknowledge that our findings are specific to the context of mental health prediction and prevention within the scope of our study. Variations in outcomes may emerge due to diverse behavioural patterns, individual distinctions, and variations in data quality. This study does not encompass all conceivable factors influencing mental health prediction and may not comprehensively address the complexities of preventing mental health issues through behavioural analysis.

**Future Scope:**

This study establishes a foundation for upcoming investigations with the aim of further enhancing the accuracy of mental health prediction. Subsequent studies can expand their perspectives to include various behavioural scenarios, explore alternative advanced machine learning models, and assess the adaptability of these strategies in dynamic mental health frameworks. Additionally, future research could delve into real-world implementation strategies and evaluate the scalability of the optimized mental health prediction measures proposed in this study.

**Conclusion:**

Centred on optimizing the accuracy of mental health prediction for preventing mental health issues, this study emphasizes the efficacy of advanced machine learning models, specifically highlighting the superiority of XGBoost over the traditional Long Short-Term Memory Network approach. This provides valuable insights into the ongoing discourse on improving mental health outcomes through sophisticated machine-learning techniques. In summary, the research underscores the substantial potential of XGBoost in refining behavioural analysis and advancing proactive prevention strategies within mental health frameworks.