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A Detailed Review on Mental Health Prediction Using Machine Learning

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Abstract: ***Mental prosperity may be a major concern inside the field of healthcare. One of the most vital reasons is the require of mindfulness among the masses. It impacts the way how one considers, feels, and acts. Mental prosperity is remarkably fundamental at each organize of life, from childhood and adolescence through adulthood. Agreeing to government quantifiable information out of the entire masses of India, 130 million individuals can be persevering from a few kind of mental sickness. Wretchedness and uneasiness spiked 25 % inside the to start with year of the distant coming to (2020).All 194 WHO portion states have gotten a handle on the Comprehensive Mental Prosperity Development Organize 2013–2030 but improvement has been coordinate. This think nearly recognizes machine learning techniques and evaluates their accuracy in recognizing mental prosperity issues utilizing numerous precision criteria.***

Keywords: Schizophrenia, Bipolar disorder , Post-traumatic , Stress disorder , Anxiety disorder

I. INTRODUCTION

Mental prosperity plays a critical portion in our each day lives.It incorporates our energized, mental, and social well-being, impacting how we think, feel, and carry on.Great mental prosperity awards us to supervise with the challenges and stresses of life, keep up strong associations, and make taught choices.One major inconvenience the society faces is that individuals endeavor to stow missing such disarranges.They are not arranged to recognize that they have any sort of mental sickness.They endeavor to protect a key remove from drawing closer mental patching centers on a wide scale.In reality on the off chance that they approach, they endeavor to cover up the truths.It is crucial to prioritize our mental wellbeing by practicing self-care, trying to discover back when required, and locks in in works out that advance energized well-being.In any case, mental prosperity issues can create, affecting our thoughts, opinions, and behaviors.It is vital to recognize and address these challenges through treatment, counseling, or other suitable trade.By prioritizing mental prosperity and searching for offer help when significant, we are going endeavor for a adjusted and satisfying life.After the COVID-19 wide, individuals from unmistakable age bunches, unmistakable callings, particular money related bunches, people, females and fair-minded sexual presentations as well are nitty abrasive to be enduringConcurring to the report by the World Prosperity Organization (WHO) discharged on 17 June 2022, we realized the genuineness of the mental thriving issues influencing the lives of the individuals.WHO characterizes mental prosperity issues as characterized by a combination of negative considerations, estimations, debilitation, quickly extending competition all through the world, and developing requests from different components ofIn advancement, the rapidly changing social circumstance is affecting mental success in a more wide run.It can have a terrible impact on a person's standard of living and relations.Schizophrenia may be a genuine mental sickness that impacts how a individual considers, feels, and carries on.Individuals with schizophrenia may show up like they have misplaced touch with reality, which can be annoying for them and their family and companions.**Schizophrenia** is periodically analyzed by side impacts such as social withdrawal, crabbiness, and continuously odd behaviors.It consolidates crazy side impacts such as visualizations, fancies, and thought clutter (irregular ways of considering), as well as reduced expression of sentiments, reduced inspiration to realize goals, burdenAccidental uneasiness may be a standard allocate of life.Different individuals extend about things such as prosperity, cash, or family issues.But **Anxiety** join more than passing extend or fear.For individuals with an anxiety disorder the uneasiness does not go lost and can get more disastrous over time.Cement clutters have a put to this category, which appear up to be startling solidify assaults and genuinely fear.The physiological signs that are caused by cement clutter connect a dashing heart, sweating, and tipsiness.**Bipolar Disorder** (once inside the past called manic-depressive sickness or hyper feel sorry for) can be a mental sickness that causes unusual shifts in a person's disposition, essentialness, actionThese shifts can make it troublesome to carry out day-to-day assignments.A couple of the time, there's an scene blended with both craziness and sadness.

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Franticness is known for fractiousness, extended essentialness and reduced require for rest.People who incorporation franticness continually show up hasty behaviors.Inside the intervals, a depressive scene for bipolar clutter is almost the same as the hopelessness side impacts.Post-traumatic extend disorder (PTSD) may be a mental success clutter that a few individuals make after they association or see a traumatic event.The traumatic occasion may be life-threatening, such as combat, a common adversity, a car mishap, or sexual catch. But a couple of the time the occasion isn't in a common sense a unsafe one.The sudden, startling passing of a cherished one can as well cause PTSD.Individuals with PTSD may maintain a strategic distance from circumstances or individuals that remind them of the traumatic occasion, and they may have solid negative responses to something standard as a uproarious commotion or an inadvertent touch.

II. MACHINE LEARNING ALGORITHMS

Machine learning may be a subfield of artificialintelligence (AI) that focuses on the advancement of algorithms and models that empower computers to memorize and make expectations or choices without being expresslymodified. It includes the consider of statistical models and calculations that permit machines to analyze and translate complex designs and information, and improve their execution over time through encounter.Logisticregressionmay be abasic and more effectivestrategy for parallel and straight classification issues. It may be a classification show, which is exceptionallysimple to realize and accomplishesexceptionallygreatexecution with linearly separable classes. It can take two values such as true/false, yes/no, and so on.k-nearest neighbors algorithm, moreover known as KNN or k-NN, may be a non-parametric, directed learning classifier, which employmentsnearnessto createclassifications or predictionsaround the gathering of an personinformation point. Whereas it can be used for either regression or classification issues, it is ordinarilyutilized as a classification algorithm, working off the assumption that comparativefocuses can be found close one another.Support Vector Machinealgorithm is to discoverthe leadingpossible line, or choice boundary, that separates the informationfocuses of diverseinformation classes. This boundary is called a hyperplane when working in high-dimensional include spaces. The thought is to maximize the edge, which is the remove between the hyperplane and the closest informationfocuses of each category, hence making it simple to recognizeinformation classes.RandomForest is utilized for both classification and regressionassignments. It is an outfitstrategy that combines numerouschoice trees to create predictions. Each choice tree in the randomforest is prepared on a irregular subset of the preparinginformation and employments a random subset of the highlights. This randomnessmakes a difference to diminish overfitting and progress the generalization ability of the demonstrate. The ultimateexpectation of the randomforest is made by aggregating the predictions of all the personchoice trees. RandomForest is known for its highaccuracy, robustness to outliers, and ability to handle large datasets.Decision treecould be a flowchart-like structure where each insidenodespeaks to a highlight or trait, each branchspeaks to a choicerule, and each leaf noderepresents the result or prediction. The decision tree algorithm learns from the training information by recursively dividing the information based on the values of the highlights, pointingto make homogeneous subsets of information at each node.**Naïve Bayes algorithm** is a directed learning algorithm, which is based on Bayes theorem and utilized for solving classification issues.

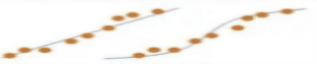
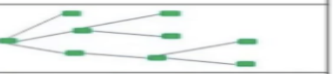
Algorithm	Keyword	Diagram
Support Vector Machines (SVM)	Vector on Points	
Naïve Bayes	Probability Distribution	
Linear Regression Logistic Regression	Straight Line Logarithmic Line	
K-Means	Kernel (*central*) Mean	
K-Nearest Neighbour	Neighbouring Points	
Decision Trees	Tree Branches	
Neural Networks	Network with Layers of elements	

Figure 1 Machine Learning Algorithms

III. LITERATURE REVIEW

This review aims to provide a concise snapshot of the ML applications in mental health also highlight the using ofdifferent ML algorithmmodel accuracy and potential opportunities.

Table 1.1 A survey of Existing Literature

Sr No.	Year	Ref	Description
1.	2023	[4]	To predict Mental disorder detection using multimodal machine learning approaches.
2.	2023	[9]	Random Forest algorithm and Support Vector Machine Algorithm, are used to predict mental health issues like Anxiety, Schizophrenia , Bipolar disorder and overall accuracy of RF 95.0% and SVM91.2%
3.	2023	[11]	Machine Learning and Deep Learning utilized by various researchers, as well as the databases used, and the challenges encountered are also outlined.
4.	2023	[12]	Several machine learning algorithms are applied, Random Forest and adaptive boosting algorithms achieved the highest accuracy for identifying negative mental well-being traits.
5.	2023	[13]	Random Forest model achieves highly significant results and the prime choice for test set prediction and accuracy of RF is 83.23% and the model gives a good F1 score of 83.53% and AUROC of 83.57%.
6.	2023	[14]	In contrast to other models, the RF performed best in predicting depression and anxiety with an accuracy of 95% f1-score 0.95, and AUC=0.96 and precision of 99%, XGBoost performance was good enough to predict suicidal prevalence with an accuracy of 79% and AUC=0.863, CNN accuracy is 96.88% for Autism Spectrum Disorder prediction.
7.	2023	[15]	KNN ,logistic regression ,Naïve Bayes algorithm are used and the accuracy of KNN and LR is 96% & 92%
8.	2023	[16]	The empirical results attested to the fact that RF outperformed the SVM with 98.13% accuracy against 97.6744%
9.	2023	[18]	Artificial Intelligence& hybrid intelligence systems impact the tasks of mental healthcare workers by providing support and enabling greater insights.
10.	2023	[19]	Accuracy reported by the RNN model is 0.78 whereas LSTM resulted in 0.82 accuracies, for detection of mental health.
11.	2023	[20]	With a 92% accuracy rate, the logistic regression model has outperformed in mental health prediction(Anxiety).
12.	2023	[21]	The data is analyzed using machine learning models, such as deep learning neural networks, support vector machines, and random forests.
13.	2023	[24]	The model is developed using machine learning techniques like CNN, 80% of the data for the training set and the remaining 20% for test data.
14.	2022	[3]	In this proposed different ML techniques are used to predict mental problems and all give more accurate results. The accuracy of all the classifiers are above 79%.
15.	2022	[1]	Machine Learning helps to understand psychiatric disorders and performance of the ML models will vary depending on the data samples obtained and the features of the data.

16.	2022	[5]	The author proposed algorithms like e logistic regression, SVM, random forest, k-neighbors for analyze mental health. From the experimental results,Logistic regression attains a higher accuracy98%.
17.	2022	[6]	Detect Mental health Prediction and to design a classification model with a help of a machine learning algorithm.
18.	2022	[8]	The authors justify that decision tree performed pretty well than the support vector machine and outperformed it by an accuracy of about 6 percent which can also be seen.
19.	2022	[22]	SVM demonstrated superior performance in overlapping settings based on F1-value and achieved 74% accuracy in Automatic speech emotion recognition for mental health using ML .
20.	2022	[23]	To predict mental health , AI model in order to create a mobile application which helps patients know more about their health problems.
21.	2022	[26]	Neural networks and Natural Language Processing techniques are used to improve results for mental health predictions.
22.	2022	[28]	SVM classifiers developed in the articles had a high accuracy of greater than 75% because data in the mental health area are scarce, SVM outperforms other machine learning methods for diagnosis.
23.	2022	[29]	machine learning, deep learning, and transfer learning methods are used for mental illness detection problem, RoBERTa transfer learning model accuracy 0.83, F1-s0.83
24.	2021	[17]	XGBoost model was chosen to anxiety and depression symptoms, as its extremely flexible approach can enable modeling of linear, nonlinear inputs.
25.	2021	[25]	Decision Tress perform better than KNN and SVM presenting an accuracy and F1-score of 0.64 and 0.61 respectively.
26.	2021	[30]	Stacking model gives the highest accuracy nearly about 88.86% using stacking algorithms in mental stress prediction
27.	2020	[2]	ML-enabled systems that are sufficiently interpretable and (clinically) useful to its target users or recipients. I
28.	2020	[7]	For the prognosis of Mental health, it consists of the data source, the feature extraction method, and classifier performance in machine learning or deep learning techniques are used.
29.	2020	[27]	The accuracy of naïve Bayes was found to be the highest, although Random Forest was identified as the best model.
30.	2019	[10]	Mental health conditions addressed depression, schizophrenia, Alzheimer's disease and ML techniques used included support vector machines, decision trees, neural networks, latent Dirichlet allocation, and clustering.

Technology Used

This table provides a chronological overview of key technologies in the fields of machine learning, deep learning, artificial intelligence, multi-modal machine learning, soft computing, and data mining techniques from 2019 to 2023.

Table 1.2 Overview on Technology usage across different years

Sr. No.	Year	Technology	References
1.	2023	Machine Learning Algorithms	[12],[13],[14],[15],[16],[21],[24]
2.	2023	Machine Learning & Deep Learning	[11]
3.	2023	Artificial Intelligence	[9],[18]
4.	2023	Multi-Modal Machine Learning	[4]
5.	2023	Soft Computing	[19]
6.	2023	Data Mining Techniques	[20]
7.	2022	Machine Learning Algorithms	[1],[3],[5],[6],[8],[22],[26],[28]
8.	2022	Deep Learning	[23],[29]
9.	2021	Machine Learning Algorithms	[17],[25]
10.	2020	Machine Learning Algorithms	[2],[7],[27]
11.	2019	Machine Learning Algorithms	[10]

IV. ANALYSIS

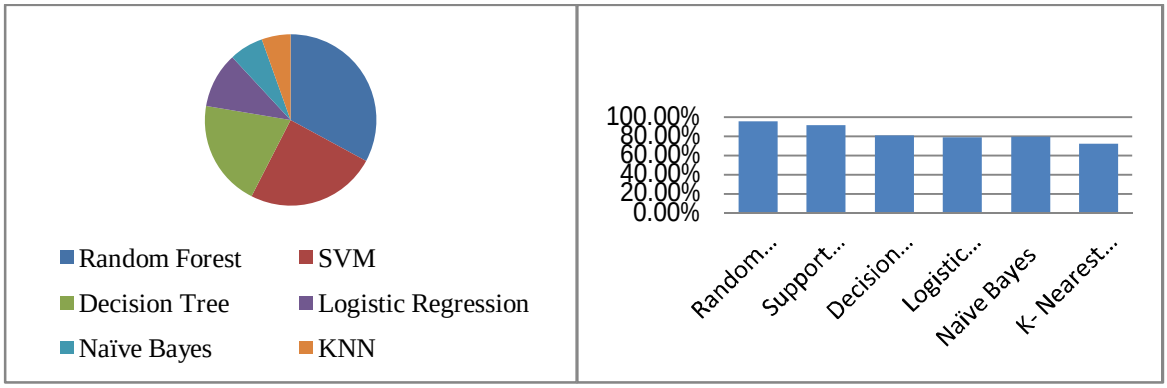


Figure 1.1Figure 1.2

In above the analysis of different Machine Learning algorithms according to their highly using in mental health predictionFigure 1.2 The developed Random forest model achieved higher accuracy of 95.0% and the SVM model achieved an overall accuracy of 91.2% , Decision tree achieved 80.42% , Logistic Regression accuracy 79.63% and K-Nearest Neighbor (KNN)achieved the 72.10% accuracy in predicting mental health disorders in the testing dataset.

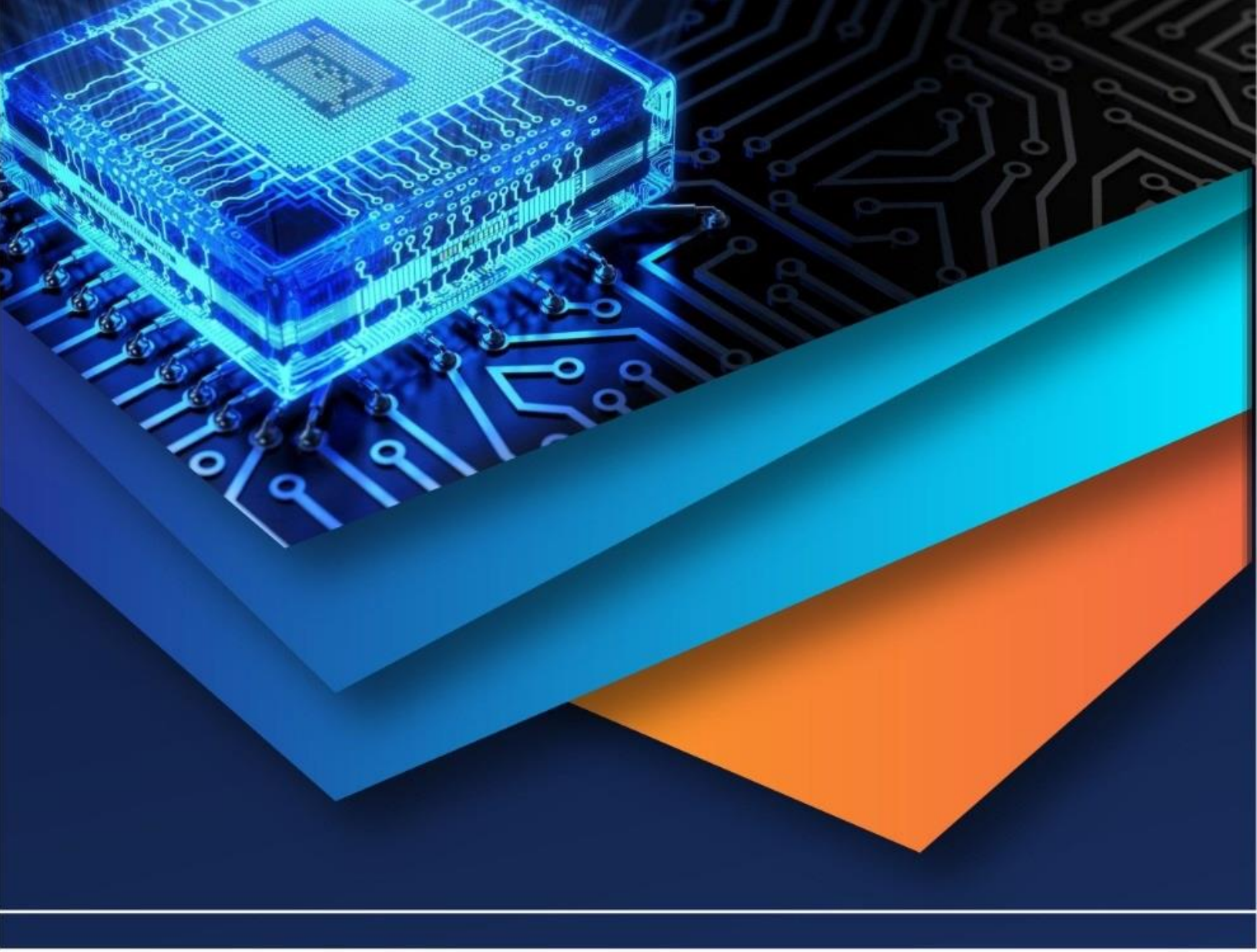
V. CONCLUSION

In today's world mental healthis a major concern. According to WHO, mental health will be a major cause of illness within the world and individualsneed to take more care about their mental well-being for a balanced social and professional life. The purpose of this review paper is to provideinformationaboutbasic concepts of ML algorithmsregularlyutilizedwithin the mental healthdomain for their practical application.

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