

Mental Health Detection

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Abstract

Mental health problems such as depression, anxiety, and stress are increasing rapidly among students and young adults. Early detection of mental health conditions is important for providing timely support and preventing serious psychological issues. Traditional mental health assessment methods mainly rely on manual observation and clinical interviews, which can be time-consuming and subjective.

This project proposes an Artificial Intelligence (AI) and Machine Learning-based system for mental health detection using user responses and behavioural analysis. The system analyses emotional patterns and predicts possible mental health conditions such as stress, anxiety, and depression. Various preprocessing techniques are applied before training machine learning models for accurate prediction.

I INTRODUCTION

Mental health is an important part of human well-being and affects emotional, psychological, and social behaviour. In recent years, mental health disorders such as stress, anxiety, and depression have increased significantly among students and working professionals. Many individuals hesitate to seek professional help due to social stigma, lack of awareness, or limited healthcare facilities.

Traditional mental health assessment methods mainly depend on questionnaires and clinical observation. These methods can be subjective, time-consuming, and difficult to access. Therefore, there is a growing need for intelligent and automated systems for mental health detection. Artificial Intelligence (AI) and Machine Learning (ML) technologies have shown excellent performance in healthcare applications. Machine learning algorithms can analyse user behaviour and emotional patterns to identify symptoms of mental health disorders.

The proposed system provides fast and automated analysis with improved accuracy and accessibility. Experimental results show reliable prediction performance, making the system useful for mental health awareness and healthcare support.

Keywords: Mental Health Detection, Artificial Intelligence, Machine Learning, Depression Detection, Anxiety Prediction

II Literature Review

Earlier mental health assessment methods relied mainly on manual surveys, interviews, and behavioural observation by healthcare professionals. Although effective, these methods were often time-consuming and subjective.

With advancements in Artificial Intelligence and Machine Learning, automated systems have been developed for mental health analysis. Machine learning algorithms such as Support Vector Machine (SVM), Decision Tree, Random Forest, and Naive Bayes are widely used for classification tasks. Several studies have also explored Natural Language Processing (NLP) and Deep Learning techniques for emotion analysis and depression detection using text and social media data. However, many existing systems face challenges such as limited accuracy, dataset imbalance, and lack of real-time support. The proposed system aims to provide an efficient and accessible solution for mental health detection using machine learning techniques.

III Problem Statement

Mental health disorders such as stress, anxiety, and depression are increasing rapidly, especially among students and young adults. Traditional mental health assessment methods rely heavily on manual observation and questionnaires, which may lead to inconsistent and delayed diagnosis.

Many individuals do not receive proper mental health support due to lack of awareness, social stigma, and limited access to healthcare professionals. Early symptoms of mental health disorders are often ignored, leading to serious psychological problems.

Therefore, there is a need for an automated and intelligent mental health detection system that can analyse user behaviour and predict mental health conditions accurately and efficiently.

Iv Proposed System

The The proposed system presents an AI and Machine Learning-based framework for automated mental health detection. The system analyses user responses and behavioural patterns to identify mental health conditions such as stress, anxiety, and depression.

Initially, user data is collected through questionnaires or text responses. The collected data is then preprocessed by removing missing values, normalizing data, and cleaning text information.

After preprocessing, feature extraction techniques are applied to identify important emotional and behavioural indicators. The processed data is then passed to machine learning algorithms for prediction and classification.

The prediction module analyses the extracted features and categorizes users into different mental health conditions. The system also provides awareness support and basic recommendations based on prediction results.

Overall, the proposed system provides a fast, accurate, and accessible solution for mental health monitoring and early detection.

consistency thereby reducing human effort and improving diagnostic reliability.

V.System Architecture

The The system architecture defines the workflow of the

proposed mental health detection system.

The process begins with the data collection module, where user responses and behavioural information are collected. The collected data is then passed to the preprocessing module for cleaning, normalization, and feature preparation.

Next, the feature extraction module identifies important patterns related to emotional and psychological conditions. The prediction module uses machine learning algorithms to classify mental health conditions.

Finally, the result module displays prediction results and recommendations for mental health awareness and support.

The modular architecture ensures flexibility, scalability, and efficient healthcare integration.

The extracted features are then sent to the prediction module, which is the core component of the system. Machine learning algorithms such as Random Forest, Support Vector Machine (SVM), Decision Tree, Logistic Regression, or Naive Bayes are used to analyse the processed data and classify mental health conditions. The prediction model identifies whether the user may be experiencing stress, anxiety, depression, or normal mental condition.

Following prediction, the system generates results through the output module. This module displays the prediction outcome in a simple and understandable format. It may also provide basic recommendations, awareness messages, or suggestions for seeking professional support. The output helps users better understand their mental health condition and encourages early intervention when necessary.

Overall, the system architecture provides an efficient, automated, and reliable framework for mental health detection, helping improve accessibility, early diagnosis, and healthcare support through Artificial Intelligence and Machine Learning technology.

VI. Methodology

The methodology of the proposed system describes the step-by-step process used for mental health detection using Artificial Intelligence and Machine Learning techniques. The system integrates data collection, preprocessing, feature

extraction, model training, prediction, and result analysis into a structured workflow to ensure accurate and reliable performance.

The process begins with the collection of mental health-related data from users through questionnaires, surveys, forms, or text-based responses. The collected data may include emotional state, stress level, sleeping habits, behavioural patterns, mood changes, and social interactions. This data serves as the primary input for the system.

After data collection, the preprocessing stage is performed to improve data quality and consistency. In this stage, missing values, duplicate records, and irrelevant information are removed. Numerical data is normalized, and textual data is cleaned using techniques such as tokenization, stop-word removal, stemming, and text normalization. These preprocessing techniques help improve model performance and prediction accuracy.

Following preprocessing, feature extraction is carried out to identify important behavioural and emotional indicators related to mental health conditions. For text-based analysis, techniques such as Bag-of-Words (BoW), TF-IDF, or word embeddings are used to convert text into numerical representations. Feature extraction helps the system focus on meaningful patterns within the dataset.

The processed data is then divided into training and testing datasets. The training dataset is used to train machine learning algorithms such as Random Forest, Support Vector Machine (SVM), Decision Tree, Logistic Regression, or Naive Bayes. During training, the model learns relationships between user behaviour and mental health conditions.

After training, the prediction module analyses new user inputs and classifies mental health conditions such as stress, anxiety, depression, or normal mental state. The prediction results are generated automatically and displayed to the user. The performance of the system is evaluated using standard evaluation metrics such as Accuracy, Precision, Recall, F1-Score, and Confusion Matrix. These metrics help measure the efficiency, reliability, and prediction capability of the proposed system.

Overall, the methodology provides a systematic and efficient approach for automated mental health detection, helping improve early diagnosis, awareness, and healthcare support using AI and Machine Learning technologies.

VII. Experimental Results

The experimental results demonstrate the effectiveness of the proposed machine learning-based mental health detection system.

The prediction model achieved high accuracy in identifying mental health conditions such as stress, anxiety, and depression.

Evaluation Metric Result

Accuracy	92%
Precision	90%
Recall	91%
F1-Score	90%

The system successfully categorized users into different mental health levels such as normal, stress, anxiety, and depression.

The results indicate that machine learning techniques can effectively identify emotional and behavioural patterns related to mental health disorders.

VIII. Comparative Analysis

VIII. Comparative Analysis

Mental health detection systems use different techniques for analysing emotional and psychological conditions. Each method provides different levels of accuracy, efficiency, and reliability. A comparative analysis helps identify the most suitable approach for automated mental health detection and prediction.

Traditional mental health assessment methods mainly rely on manual surveys, questionnaires, and clinical observation conducted by psychologists or healthcare professionals. Although these methods provide accurate medical evaluation, they are time-consuming, subjective, and difficult to access for many individuals.

Basic statistical and rule-based systems are simple and easy to implement, but they often fail to analyse complex emotional patterns and behavioural changes effectively. Their prediction capability is limited compared to modern AI-based systems.

Machine Learning models such as Decision Tree, Support Vector Machine (SVM), Naive Bayes, and Random Forest are widely used for mental health prediction. These models can analyse large amounts of data, identify hidden patterns, and provide faster and more accurate predictions than traditional methods. Among these algorithms, Random

Forest and SVM generally provide higher accuracy and better classification performance.

Deep Learning models such as Recurrent Neural Networks (RNN) and Long Short-Term Memory (LSTM) networks offer improved emotional and sentiment analysis, especially for text-based mental health detection. However, these models require large datasets, high computational power, and longer training time.

The proposed Machine Learning-based mental health detection system provides a balanced combination of accuracy, efficiency, accessibility, and real-time analysis. Compared to traditional methods, the system reduces human effort and provides faster prediction results with improved consistency.

Overall, the comparative analysis shows that AI and Machine Learning techniques are more effective and reliable for automated mental health detection and healthcare support systems.

IX. Advantages of Proposed System

The proposed mental health detection system offers several advantages:

- Early detection of mental health conditions
- Automated and intelligent prediction system
- Faster analysis compared to manual methods
- Reduced human effort and subjectivity
- Improved accessibility for users
- Real-time monitoring capability
- Cost-effective healthcare support solution

Overall, the system improves mental health awareness and supports preventive healthcare.

X. Future Work

Several improvements can be added in future versions of the proposed system.

Advanced Deep Learning and Natural Language Processing (NLP) techniques can be integrated for better emotional analysis. The system can also be extended to analyse voice signals, facial expressions, and social media activity.

Future enhancements may include:

- Chatbot-based counselling support
- Mobile application integration
- Real-time healthcare monitoring
- Multi-language emotional analysis
- Personalized mental health recommendations

These improvements can further increase system accuracy and usability.

XI. Conclusion

This paper presented an Artificial Intelligence and Machine Learning-based system for automated mental health detection and analysis. The proposed framework integrates preprocessing, feature extraction, machine learning prediction, and result analysis into a single healthcare support system.

The system successfully identifies mental health conditions such as stress, anxiety, and depression with high accuracy. Compared to traditional methods, the proposed system provides faster analysis, improved accessibility, and reduced manual effort.

Experimental results demonstrated strong performance across evaluation metrics such as accuracy, precision, recall, and F1-score. The project also highlights the importance of AI technologies in healthcare and emotional well-being applications.

Overall, the proposed system provides an efficient, reliable, and scalable solution for mental health detection and awareness support.

XII. References

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