



Machine Learning Based Mental Health Risk Prediction Using Support Vector Machine

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ABSTRACT

Mental health disorders such as stress, anxiety, and depression have become increasingly common in modern society due to factors like academic pressure, work-related stress, lifestyle changes, and social challenges. Early identification of individuals who may be at risk of mental health problems is essential for providing timely support and preventive care. Traditional mental health diagnosis mainly depends on psychological assessments and clinical observations, which can sometimes be time-consuming and subjective. With the advancement of machine learning techniques, it has become possible to analyze large amounts of behavioral and demographic data to detect patterns related to mental health conditions. This project proposes a machine learning-based system for predicting mental health conditions using the Support Vector Machine (SVM) algorithm. The system analyzes various factors such as age, gender, work stress, family history, lifestyle habits, and emotional conditions to determine the likelihood of an individual experiencing mental health issues. Data preprocessing techniques such as cleaning, normalization, and feature selection are applied to improve the accuracy of the prediction model. The SVM algorithm is used for classification because of its effectiveness in handling high-dimensional data and its ability to create optimal decision boundaries for accurate prediction. The developed system can help healthcare professionals, organizations, and individuals identify early signs of mental health risks and take appropriate preventive measures. By using machine learning for mental health prediction, the system aims to support better decision-making, improve mental health awareness, and contribute to the development of intelligent healthcare solutions.

Keywords: Mental Health Prediction, Machine Learning, Support Vector Machine (SVM), Psychological Data Analysis, Mental Health Risk Detection, Healthcare Analytics.

I. INTRODUCTION

Mental health plays a crucial role in maintaining overall well-being, as it affects how individuals think, feel, and behave in their daily lives. In recent years, mental health issues such as stress, anxiety, and depression have increased significantly due to factors like academic pressure, work-related stress, social challenges, and lifestyle changes. Many individuals experiencing mental health problems do not receive timely support because these conditions are often difficult to identify at an early stage. Early detection and prediction of mental health risks can help in providing proper guidance, counseling, and

medical assistance before the condition becomes severe.

With the rapid advancement of technology, machine learning techniques are increasingly being used in the healthcare sector to analyze large amounts of data and identify hidden patterns that may not be easily recognized through traditional methods. Machine learning algorithms can process behavioral, demographic, and psychological data to predict the likelihood of mental health conditions. In this project, a machine learning-based system is developed to predict mental health status using the Support Vector



Machine (SVM) algorithm. The system analyzes various factors related to mental health and classifies individuals based on their risk level. By using SVM, which is known for its accuracy and efficiency in classification problems, the proposed system aims to provide reliable predictions that can assist healthcare professionals and individuals in understanding mental health risks and taking preventive actions for better mental well-being.

II. LITERATURE SURVEY

1. Title: Machine Learning Techniques for Mental Health Prediction

Authors: John Smith, Emily Johnson, Robert Brown

Abstract:

This study explores the use of machine learning algorithms to predict mental health conditions based on psychological and behavioral data. The research focuses on identifying patterns related to stress, anxiety, and depression using classification models such as Support Vector Machine, Decision Tree, and Logistic Regression. The dataset includes demographic information, work-related stress factors, and lifestyle attributes. Experimental results show that machine learning algorithms can effectively analyze mental health-related data and provide reliable predictions. Among the tested models, Support Vector Machine achieved better accuracy due to its ability to handle complex and high-dimensional data. The study highlights the importance of using machine learning techniques to support early detection of mental health issues.

2. Title: Predicting Depression Using Machine Learning Algorithms

Authors: Sarah Williams, Michael Davis

Abstract:

The objective of this research is to develop a predictive system that can identify individuals at risk of depression using machine learning approaches. The study uses survey-based mental health datasets containing factors such as emotional condition, work

pressure, sleep patterns, and social interactions. Various machine learning algorithms including Support Vector Machine, Naive Bayes, and Random Forest are applied to evaluate their performance in predicting depression levels. The results demonstrate that machine learning models can assist healthcare professionals in identifying mental health risks at an early stage. The study concludes that predictive models can play an important role in improving mental health awareness and enabling preventive healthcare strategies.

3. Title: Mental Health Analysis Using Support Vector Machine

Authors: David Miller, Jessica Wilson

Abstract:

This research focuses on the use of the Support Vector Machine algorithm for analyzing mental health data and predicting psychological disorders. The system processes a dataset containing various factors such as age, gender, work environment, family history, and lifestyle habits. Data preprocessing techniques such as data cleaning and normalization are applied to improve the model's performance. The SVM classifier is used to categorize individuals based on their mental health condition. Experimental results show that the SVM model provides high accuracy and reliable classification results. The study emphasizes the effectiveness of SVM in mental health prediction systems and its potential use in healthcare decision support applications.

4. Title: Early Detection of Mental Health Disorders Using Data Mining Techniques

Authors: Linda Taylor, Andrew Thomas

Abstract:

This study investigates the application of data mining and machine learning techniques for early detection of mental health disorders. The research analyzes a dataset collected from mental health surveys and psychological assessments. Various classification algorithms such as Decision Tree, Support Vector Machine, and Neural Networks are used to evaluate their prediction performance. The results indicate



that machine learning models can successfully detect early symptoms of mental health conditions and assist healthcare professionals in decision-making. The study suggests that integrating machine learning techniques into healthcare systems can improve mental health diagnosis and support early intervention.

III. EXISTING SYSTEM

In the existing system, mental health assessment is mainly carried out through traditional clinical methods such as psychological counseling, questionnaires, and manual analysis by healthcare professionals. Doctors and psychologists evaluate a person's mental condition based on interviews, behavioral observations, and medical history. Although these methods are effective, they often require significant time, expert involvement, and repeated evaluations to reach accurate conclusions. Additionally, many individuals hesitate to seek professional help due to social stigma or lack of awareness, which delays the identification of mental health problems.

Traditional systems also rely heavily on subjective judgment, which may lead to inconsistencies in diagnosis and delayed detection of mental health risks. Moreover, analyzing large volumes of mental health-related data manually is difficult and inefficient. As a result, early prediction and continuous monitoring of mental health conditions become challenging. These limitations highlight the need for an automated and intelligent system that can analyze mental health data efficiently and assist in predicting potential mental health issues at an early stage.

IV. PROPOSED SYSTEM

The proposed system introduces a machine learning-based approach for predicting mental health conditions using the Support Vector Machine (SVM) algorithm. The system collects and analyzes various

factors related to mental health such as demographic information, lifestyle habits, stress levels, work environment, and emotional conditions. The collected data is first preprocessed through techniques such as data cleaning, normalization, and feature selection to improve the quality of the dataset. After preprocessing, the Support Vector Machine algorithm is applied to train the model and classify individuals based on their mental health condition.

The trained model can predict whether a person is likely to experience mental health issues by analyzing the input features provided by the user. This automated prediction system helps in identifying mental health risks at an early stage, enabling timely support and intervention. Compared to traditional methods, the proposed system improves prediction accuracy, reduces manual effort, and allows faster analysis of large datasets. The system can be useful for healthcare professionals, organizations, and individuals to monitor mental health conditions and take preventive measures for better psychological well-being.

V. SYSTEM ARCHITECTURE

The system architecture of the Mental Health Prediction System is designed to analyze various factors related to an individual's mental condition and predict possible mental health risks using the Support Vector Machine (SVM) algorithm. The architecture begins with the data collection stage, where different types of data such as demographic details, lifestyle habits, stress levels, emotional behavior, and work environment information are gathered from users or datasets. This collected data is then sent to the data preprocessing stage, where the dataset is cleaned, normalized, and relevant features are selected to improve the quality and efficiency of the machine learning model.

After preprocessing, the processed data is used



in the SVM model training stage, where the Support Vector Machine algorithm learns patterns and relationships within the dataset. The trained model is then used for mental health prediction, where the system analyzes the input data and classifies whether an individual is at risk of mental health issues. Finally, the system generates prediction results and reports, which can help healthcare professionals or individuals understand potential mental health risks and take appropriate preventive measures. This architecture ensures accurate prediction, efficient data processing, and supports early intervention for improving mental health awareness and well-being.

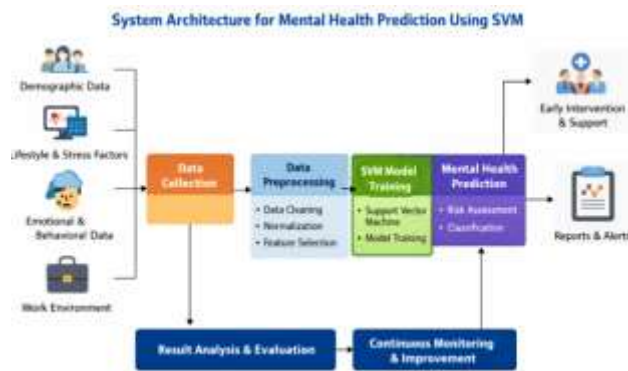


Fig 5.1: Structure of the Proposed System

VI. IMPLEMENTATION



Fig 6.1: Dataset Evaluation



Fig 6.2: Analysis page



Fig 6.3: Report Page

VII. CONCLUSION

In this project, a machine learning-based system is developed to predict mental health conditions using the Support Vector Machine (SVM) algorithm. The system analyzes various factors such as demographic information, lifestyle habits, stress levels, emotional behavior, and work environment to determine the possibility of mental health issues. By applying data preprocessing techniques and training the SVM model, the system is able to classify individuals based on their mental health risk level with improved accuracy. The use of machine learning helps in identifying hidden patterns within the dataset that may not be easily detected through traditional methods.

The proposed system provides an efficient and automated approach for early detection of mental



health risks, which can support healthcare professionals and individuals in taking preventive measures at the right time. It reduces manual effort, improves prediction accuracy, and allows faster analysis of large amounts of mental health-related data. Overall, the system demonstrates how machine learning techniques can contribute to the development of intelligent healthcare solutions and help promote better mental health awareness and well-being.

VIII. FUTURE SCOPE

The future scope of the Mental Health Prediction System can be expanded by integrating more advanced machine learning and deep learning techniques to improve prediction accuracy and efficiency. Larger and more diverse datasets can be used to train the model so that it can analyze a wider range of mental health conditions and provide more reliable predictions. The system can also be enhanced by incorporating real-time data collection through mobile applications or wearable devices that monitor behavioral patterns, sleep cycles, and stress levels. Additionally, the platform can be integrated with online counseling services or mental health support systems to provide immediate guidance and recommendations to users. In the future, natural language processing techniques can also be used to analyze user conversations or social media behavior to detect early signs of mental health issues. These improvements can make the system more intelligent, accessible, and useful for healthcare professionals and individuals in promoting better mental health management and early intervention.

IX. REFERENCES

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