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Early Diagnosis Of Psychological Disturbances Using Machine Learning

Mr. M S V V Ramesh ¹, Mr. M .VeeraBabu ², Allam Lakshmi Kailash ³, Kotipalli Meghana ⁴, Dama Nohitha ⁵, Dangeti Naga Sai Bhaskar ⁵

^{1, 2} Assistant Professor, ^{3, 4, 5, 6} B.Tech Students,

Department of CSE (Artificial Intelligence),

Pragati Engineering College, ADB Road, Surampalem, Near Kakinada, East Godavari District, Andhra Pradesh, India 533437.

ABSTRACT:

MindWell AI is a project that provides both AI mental health assessments and chatbot chat support. The project has a Flask based backend and its frontend is based on React having features like JWT authentication and prediction of mental health disorders with the help of machine learning model. In this document, I explain the motivation behind and the scope of this project and state the problem that this system tries to solve focusing on the model that it adopts, followed by the literature review. They wanted to provide an intuitive and interactive platform to help improve the access to mental health support by allowing users to self assess their own well being and get guidance. Mental health troubles being on the rise, there is a high urge for tech solutions. Large segment of the population undergoes stress, anxiety, and depression which makes AI based interventions required. The aim of this project is to close the gap between professional mental care and people seeking first assessments. The system, utilizing predictive analytics and chatbot interactions gives them a nonjudgmental, affable, and informative platform to interact with. Additionally, the platform for scalability and security, aiming it with best industry practices to defend the user data. With modern web technologies integrated, we are able to provide a very smooth user experience, and keep the service up and running using continuous testing and monitoring of its performance. With mental health being one of the most important aspects to a person's overall health, MindWell AI takes the cake as a big step towards making health resources accessible, combining technology with empathy to create a friendly environment.

KEYWORDS:

MindWell, Mental Health Assessments, JWT Authentication.

1. INTRODUCTION

Overall wellbeing is not complete without taking care of mental health, which can be an issue when people cannot find timely and appropriate support. With the development of AI driven solutions, there have been several ways developed to bring these gaps down. MindWell AI is an advanced AI based system which helps the user in self assessment with interactive chatbot support to users who are experiencing psychological distress. The system takes advantage of state of the art machine learning models trained on a comprehensive set of mental health datasets to provide personalized assessments and actionable recommendations about any mental health related issue. MindWell AI is able to do this through sophisticated predictive algorithms, like gradient boosting classifiers, that are able to analyze user inputs and provide real time insights into a user's mental state to see if there is a potential issue stuck at the forefront while preventing it from escalating.

Recently, there is much awareness on mental health but the stigma still blocks many to get the help of a professional. Promising interventions are posed to be offered by AI powered mental health solution in form of early detection and constant support. As well as analyzing user responses, MindWell AI helps users lead their way to emotional well being via an AI chat bot. Here is what I feel – What this approach can do to the ecosystem is to disrupt the mental healthcare and provide real time, affordable and decentered mental health solutions to those in need.

Additionally, the system's designed with modules and robust backend infrastructure with

such features that it becomes easily maintainable and scalable. MindWell AI stresses on data security, user privacy and consistent performance monitoring, and is designed to cater to the evolving needs of users whilst pioneering the cause of applications of technology in the mental health domain.

Looking ahead, by adopting AI forced system such as MindWell AI we would be able to largely mitigate the burden traditional healthcare service places on as well as create the conditions for proactive and preventive mental health measures. This document explains system's architecture, data flow, and potential value in regards to making mental health care accessible.

2. OBJECTIVES OF STUDY

The aim of this study is to develop AI powered mental health assessment system that can analyze and predict user's response towards the tool that can be potential causes of psychological disorders. The system is designed to offer continuous emotional supports and mental well being counseling by integrating a chatbot. The platform applies machine learning models trained on mental health datasets to deliver personalized assessments and actionable recommendations to encourage early intervention. The project aims to create a digital and accessible process to promote access to mental health resources through providing a secure, private, and user friendly solution. In addition, the purpose of the study is to enhance mental health literacy by empowering the user with real time insights about his or her emotional well being and use this in a proactive way to self care. The chatbot is set up with the intention of having engaging, empathetic, and supportive interactions in order to ensure effectiveness of the platform. The system is built with privacy features of the data and industry best practice. The predictive accuracy, as well as the recommendations, of the AI model will keep improving through continuous learning and feedback mechanisms. In the end, this research intends to close the gap between existing traditional mental healthcare and digital interventions, creating a trustworthy, cheap, and reachable solution to other people who need to go through a preliminary mental health evaluation.

Key Objectives

1. Build an AI based assessment system for psychological well being.
2. Include an interactive chatbot for live emotional support and well being guidance.
3. Use machine learning models to provide personalized assessments or recommendations.
4. Provide access to secure and user-friendly digital platform for enhanced accessibility of mental health support.

5. Provide real time emotional insights which improve mental health literacy of the end users.
6. Imagine the chatbot as the one that will have empathetic, engaging and supportive conversations.
7. Use your wide choice of popular programming languages to build scalable, secure, and data private products by means of industry standard best practices.
8. To refine the accuracy of an AI model and its recommendations, put AI mechanisms for continuous learning in place.
9. Leverage on how AI will help bridge the gap between the traditional mental healthcare and digital AI driven solution to mental health problems.
10. Contributes to the AI research of mental healthcare through existing limitations and enhancements.

3. BACKGROUND WORK

The most crucial phase in software development is the background work. Numerous writers conducted preliminary studies on this relevant topic, and we will consider key papers to expand our work. The integration of artificial intelligence (AI) into mental healthcare has been the subject of numerous studies, particularly those published in IEEE and Springer journals. Below is a literature survey table summarizing key research contributions in this domain:

Author(s) and Year	Paper Title	Findings and Problem Gap
Aggarwal et al., 2023	Artificial Intelligence-Based Chatbots for Promoting Health Behavioral Changes: Systematic Review[1]	Evaluated the feasibility and efficacy of AI chatbots in health behavior change. Found high efficacy in promoting healthy lifestyles and smoking cessation but noted mixed results in feasibility and usability. Highlighted the need for robust randomized control trials to establish definitive conclusions.
Omarov et al., 2022	Artificial Intelligence-Enabled Chatbots in Mental Health: A Systematic Review[2]	Reviewed AI-enabled chatbots in mental healthcare, focusing on technologies, psychological disorders addressed, and ethical challenges. Identified a substantial gap between AI advancements and their widespread clinical application, emphasizing the need for ethical

		considerations.				
Lavhare & Kulkarni, 2021	Mental Disorders Detection Using Social Networking Sites[3]	Investigated the use of social media data for detecting mental disorders. Demonstrated potential in identifying mental health issues through online behavior analysis but raised concerns about privacy and data accuracy.		Artificial Intelligence and Machine Learning[9]	nurses in promoting mental health among students. Identified four categories of support but lacked extensive user testing and validation.	
Mondéjar et al., 2019	Brapolar: An m-Health Application for Remote Monitoring of People with Bipolar Disorder[4]	Developed a mobile health application for remote monitoring of bipolar disorder patients. Showed promise in continuous patient monitoring but faced challenges in user engagement and data interpretation.		Zhang et al., 2020	Artificial Intelligence Chatbot Behavior Change Model for Designing Artificial Intelligence Chatbots to Promote Physical Activity and a Healthy Diet: Viewpoint[10]	Proposed a behavior change model for AI chatbots aimed at promoting physical activity and healthy eating. Offered a theoretical framework but required empirical validation.
Fitriati et al., 2019	Early Detection Application of Bipolar Disorders Using Backpropagation Algorithm[5]	Created an application for early detection of bipolar disorder using backpropagation algorithms. Achieved notable accuracy but required larger datasets for validation.				
Reddy et al., 2018	Machine Learning Techniques for Stress Prediction in Working Employees[6]	Explored machine learning methods to predict stress levels among employees. Identified key stress indicators but highlighted the need for real-time data collection for improved accuracy.				
Khan et al., 2018	Supporting the Treatment of Mental Diseases Using Data Mining[7]	Applied data mining techniques to support mental disease treatment. Found potential in identifying patterns in patient data but noted limitations due to data heterogeneity.				
Dhaka & Johari, 2016	Big Data Application: Study and Archival of Mental Health Data, Using MongoDB[8]	Discussed the use of big data technologies for storing and analyzing mental health data. Emphasized scalability but pointed out challenges in data integration from diverse sources.				
Yadav et al., 2023	A Mental Health Chatbot Based on	Designed a chatbot to assist school				

This table encapsulates the significant strides made in AI-driven mental health interventions, highlighting both the advancements achieved and the existing gaps that necessitate further research and development.

4. EXISTING SYSTEM

Current traditional mental health diagnostic systems are based on the manual evaluation by mental health professionals. Conducting these assessments almost always involve in person consultations; structured interviews; and standardized paper based or digital questionnaires. Though these methods have a clinical validity, they have their disadvantages such as long waiting times, availability of professionals is limited and also not accessible in remote or underserved areas. Additionally, practices that are highly reliant on face to face interactions may deter individuals with the fear social stigma or without the financial resources to pay for those that are face to face. Additionally, the traditional sources of mental health support traditionally do not offer real time support, hence leading to individuals having no aid when on the verge of helplessness. Without AI driven analytics assessments can not adapt to an evolving mental state of an individual. Most digital platforms that provide symptom checkers do not integrate real time predictive analytics or have conversational support via a chatbot to be the best in proactive mental healthcare.

Limitations of the Existing System

- Time-Consuming requires appointment scheduling and long waiting periods.
- Static assessments do not personalize to the individual response.
- The Available Food is limited by Accessibility :Geographic, financial, and infrastructural barriers act as limiting factors to the access.
- Fear of judgment make many NOT to seek for help.
- No Real-Time Support – Lacks instant AI-driven interaction for immediate assistance.

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5. PROPOSED SYSTEM

The proposed system is an empathetic chatbot that on an AI enabled platform that facilitates real time support to the user through predictive analytics. Then, it utilizes a Gradient Boosting machine learning model to analyze user's responses to understand better how to provide personalized insights about mental health. With cultural sensitivity, info is given regionally such as local coping strategies like yoga, local helplines etc. The system exhibits a modular and scalable architecture which thus enables easy and flexible scalability for diverse user demographics. Users will access assessments and chatbot support 24/7 with web based interface. Moreover, data security is considered with JWT token authentication and encrypted cookies on the platform. Assessment history can be tracked over time using the SQLite database, and the users can track their progress of mental health history. This system closes the gap between professional mental healthcare and the people that need preliminary assessments by providing an accessible, cost effective and personal sable solution.

Advantages of the Proposed System

1. **Accessibility Time** – Since it's a web based interface users can use assessments and chatbot support 24/7.
2. **Personalized Diagnostics** – Uses 13+ symptoms explored by AI in order to find out which disorder you're suffering from.
3. **Cultural Sensitivity** – This incorporates the Indian cultural context and provides culturally localized helplines, web chats and coping strategies.
4. **Data Security** – JWT authentication and encrypted cookies is used to keep the user's data safe.
5. **For this reason, it is Cost Effective** as it helps to reduce on in person consultations through automation of workflows.
6. **Historical Tracking** – Stores assessment history for long-term mental health monitoring.
7. **Modular architecture** supports easily expandable and adaptable system.

6. PROPOSED MODEL

Algorithm for Mental Health Disorder Prediction using Gradient Boosting

Step 1: Data Preprocessing

1. Collect and clean mental health dataset (symptoms, responses, demographic factors).
2. Handle missing values and perform data normalization if necessary.
3. Encode categorical features (e.g., symptom severity levels) using one-hot encoding or label encoding.
4. Split data into training and testing sets (e.g., 80% training, 20% testing).

Step 2: Model Training (train_model.py)

1. Import necessary libraries (Scikit-learn, Pandas, NumPy).

2. Initialize the **Gradient Boosting Classifier** model.
3. Train the model on labeled mental health data.
4. Use **iterative refinement** by adjusting weights of previously misclassified cases.
5. Perform hyperparameter tuning (e.g., learning rate, number of estimators, maximum depth) to optimize performance.
6. Save the trained model for future predictions.

Step 3: Prediction Execution (model_loader.py)

1. Load the trained model for real-time prediction.
2. Accept new user responses from the chatbot or assessment form.
3. Preprocess input data to match the training format.
4. Pass the processed data into the trained **Gradient Boosting** model.
5. Generate disorder predictions along with **confidence scores**.
6. Return the prediction results to the chatbot interface for personalized recommendations.

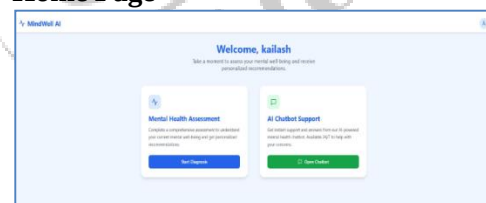
Step 4: Confidence Scoring and Decision Making

1. Compute confidence scores for each prediction to assess reliability.
 2. If confidence is low, prompt the user for additional inputs to refine predictions.
 3. If high-risk symptoms are detected, suggest immediate professional consultation.
 4. Store results in an **SQLite database** for longitudinal mental health tracking.
- This algorithm ensures accurate, data-driven, and personalized mental health assessments, helping users gain insights into their well-being while offering real-time support.

7. EXPERIMENTAL RESULTS

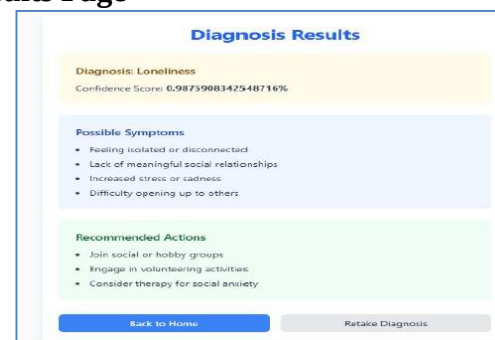
In this project, we utilized Python as the programming language to develop the proposed application, which is executed on Uses Flask to serve dynamic HTML templates for user interaction.

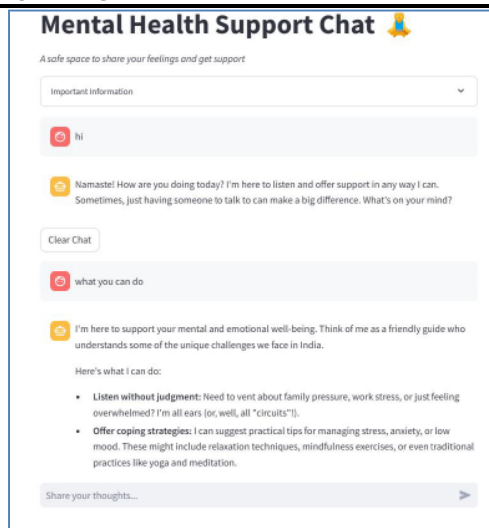
Home Page



Explanation: This interface defines Frontend Home Page Screenshot

Results Page





Explanation: The above window clearly defines the mental health support chat window.

8. CONCLUSION & FUTURE WORK

Mind Well manages to develop a Flask powered backend, a frontend supported by React and a Gradient Boosting classifier that offers AI driven mental health assessments. The system uses machine learning techniques and secure authentication mechanisms to provide custom mental health insights and secure data storage. Its modular architecture ensures future updates of the calculator and makes it maintainable and scalable. The user engagement is facilitated by chatbot driven interface through continuous emotional support. To meet the increasing demand for mental health support that is accessible, data driven, and suitable for people who are prone to ask that crucial first question, Mind Well is rigorously tested and optimized to become a reliable and intelligent platform to give people preliminary assessments and guidance.

Future Work

In order to improve Mind Well, the progress to be made in future is to increase system performance and scalability, and facilitate its integration with healthcare services. Changing from SQLite to PostgreSQL will allow handling of larger datasets that will improve prediction accuracy. Assessments will be refined using advanced machine learning models and also deep learning techniques. This will integrate hospitals and facilitate real-time data sharing to better the clinical relevance. Multi factor authentication will strengthen data protection by way of security measures. Chatbot intelligence will be improved and will provide more empathetic interactions. The API will be responsive in usage and under heavy usage because we will optimize API performance. The upgrades will Mind Well to be a full, scalable, and clinically relevant mental health platform. The Signature Fraud Detection System effectively leverages deep learning techniques to enhance signature verification, offering a reliable and automated approach to fraud detection. By utilizing a Convolutional Neural Network (CNN) integrated with a Flask-based web application, the system ensures real-time verification, reducing reliance on error-prone manual methods. The model accurately analyzes stroke consistency, pen pressure, and spatial patterns, improving detection accuracy. Through comprehensive testing, the system has demonstrated high precision in

distinguishing genuine signatures from forgeries. Its scalability and efficiency make it a valuable solution for banking, legal, and corporate applications, significantly enhancing document security and fraud prevention.

9. REFERENCES

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