Branching Minds: A Random Forest Approach for Mental Health Detection

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Abstract

Mental health, encompassing emotional, psychological, and social well-being, plays a vital role in shaping how individuals think, feel, and act, as well as their ability to manage stress, build relationships, and make decisions. Despite its significance, mental health is often underprioritized compared to physical health due to persistent stigma, shame, and fear of judgment. Existing detection systems typically focus on a narrow range of disorders—such as depression—while overlooking others like anxiety, bipolar disorder, post-traumatic stress disorder (PTSD), and eating disorders. Furthermore, these systems frequently lack personalization and comprehensive data integration. To address these limitations, this study proposes an inclusive mental health detection system leveraging a Random Forest algorithm to enhance diagnostic accuracy and evaluate the severity of multiple mental health conditions through a structured and adaptive questionnaire. The system incorporates four key features: (1) a Questionnaire Session to identify potential issues, (2) a Severity Check to assess the seriousness of detected conditions, (3) a Doctor Recommendation System for personalized psychiatrist suggestions, and (4) an Online/Offline Appointment Booking module to facilitate timely access to care. By integrating machine learning with personalized care and user-friendly design, the proposed solution empowers individuals to proactively monitor their mental health, seek timely intervention, and reduce stigma. This approach offers a more accurate, inclusive, and supportive model for modern mental healthcare.

Keywords: Mental Health Detection, Random Forest-Based Diagnosis, Personalized Care, Severity Assessment, Machine Learning in Healthcare, Mental Disorders, Doctor Recommendations, Appointment Booking

1. Introduction

Mental health is a vital component of overall well-being, influencing how individuals think, feel, and interact with others. In today's fast-paced and stressful world, mental health challenges such as anxiety, depression, and bipolar disorder are increasingly common. Despite its significance, mental health is often overlooked due to stigma, lack of awareness, and limited access to professional care. A comprehensive and user-friendly system can help address these issues by assessing a wide range of mental health conditions through detailed questionnaires. Advanced machine learning techniques, like the Random Forest algorithm, enable accurate detection and severity assessment of various mental health disorders based on user responses. Beyond diagnosis, personalized recommendations for mental health professionals tailored to individual needs improve access to care. The system also facilitates convenient appointment booking, reducing barriers to seeking help. Prioritizing privacy and reducing stigma, such a system creates a confidential environment that encourages individuals to take proactive steps toward managing their mental well-being. This approach aims to transform the detection and treatment of mental health conditions, promoting better overall health and quality of life.

1.1. Problem Statement

Mental health issues are often ignored due to stigma, lack of awareness, and poor access to care. Existing

systems mainly focus on disorders like depression and anxiety, missing out on others like bipolar or eating disorders. They use generic questionnaires and don't provide personalized results or guidance. Even after detection, people struggle to find the right professionals or book appointments easily. A smarter, broader, and more user-friendly solution is needed. [1]

1.2.Objectives

The main objective of this project is to build an intelligent system that can accurately detect various mental health conditions such as depression, anxiety, bipolar disorder, PTSD, and eating disorders. Unlike traditional systems that focus only on common issues, this model uses machine learning particularly the Random Forest algorithm—to identify multiple conditions along with their severity. The system uses a simple yet smart questionnaire to collect user input in a private and comfortable manner. Based on the analysis, it not only detects the condition but also recommends appropriate professionals—psychiatrists, psychologists, or counsellors tailored to the user's specific mental health needs. To make mental health support more accessible, the system includes features for booking both online and offline appointments. It also helps reduce stigma by offering users a safe space to self-assess and seek help early. In short, the objectives are:

- Detect a wide range of mental health conditions with accuracy.
- Recommend personalized professional support.
- Make help easily accessible through appointment booking.
- Encourage early intervention and reduce mental health stigma.

2. Methodology

This section outlines the steps taken to design a multi-stage mental health detection system using machine learning. It combines personalized questionnaire data with algorithmic analysis to detect conditions, assess severity, and provide supportive features like doctor recommendations.

2.1.Data Collection and Preprocessing

The first step involves gathering relevant mental health data through personalized questionnaires designed to capture symptoms related to anxiety, PTSD, eating disorders, and other conditions. The data is collected securely to ensure user privacy. Preprocessing involves cleaning the data by handling missing values, normalizing responses, and encoding categorical variables. This ensures high-quality input for AI analysis. Data anonymization techniques are applied to maintain confidentiality and comply with privacy standards

2.2.Harnessing the Power of AI-Driven Analysis

Using machine learning algorithms, specifically a Random Forest model, the preprocessed data is analyzed to detect and classify mental health conditions. The model is trained on a labeled dataset to recognize patterns and severity indicators. This AI-driven approach allows for personalized, accurate detection by considering various symptom combinations and severity levels. The model is continuously refined to improve prediction accuracy and reduce false positives or negatives.

2.3.Severity-Based Tiered Intervention Framework

Based on the AI analysis results the system implements a tiered intervention approach. This prioritizes mental health conditions according to their severity and urgency. Interventions range from self-help resources and digital therapeutic exercises to recommendations for professional counseling or emergency support. The tiered system ensures users receive tailored support that matches their specific needs, promoting timely and effective mental health care.

2.4.Built-In Privacy and Security for Mental Health Data

Privacy and data security are central to the system's architecture. User data is encrypted both at rest and in transit. Access controls and anonymization techniques prevent unauthorized data exposure. The design complies with data protection regulations such as GDPR. Users have control over their data sharing preferences, and the system ensures transparency about data use to build trust and encourage participation models.

2.5.User-Focused Enhancing Experience and Accessibility

The platform is developed with a strong emphasis on user experience. This includes intuitive interfaces for the questionnaire, clear explanations of AI results, and easy navigation through intervention options. Accessibility features are integrated to accommodate diverse user groups. Feedback mechanisms allow users to report issues or suggest improvements, fostering continuous enhancement of the system based on real user needs. [2]

2.6. User-Friendly Dashboard for Monitoring Mental Health Progress

An interactive dashboard provides users and clinicians with visual insights into mental health status and intervention progress. The dashboard displays AI predictions, symptom trends over time, and personalized recommendations. It supports data-driven decision-making by making complex information accessible and actionable. The dashboard also includes privacy settings, allowing users to control who can view their data. [3]

- **Branching Minds in Action**: Real-Time Applications
- **Healthcare Settings:** Branching Minds can assist clinics and hospitals with quick, AI-powered mental health screening, enabling early detection and personalized treatment based on condition severity.
- **Telemedicine:** The system enhances virtual consultations by providing real-time mental health insights, supporting accurate remote diagnosis and timely referrals.
- **Educational Institutions:** Used to monitor student mental health and enable early intervention. [4]
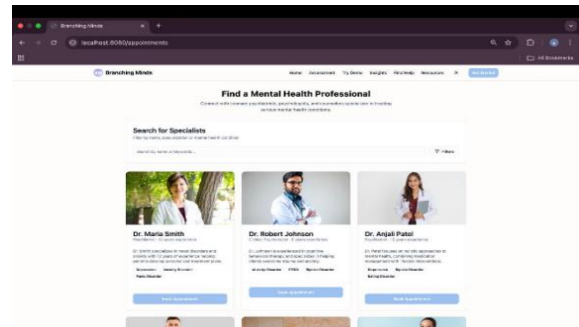
3. Results and Discussion

Branching Minds is an advanced mental health detection platform designed to identify a broad spectrum of emotional and psychological conditions, including depression, anxiety, bipolar disorder, PTSD, OCD, ADHD, eating disorders, and sleep-related issues. The system employs structured, age- and demographic-tailored questionnaires combined with intelligent AI analysis, specifically leveraging the Random Forest algorithm, to deliver highly accurate predictions and severity assessments. One of the key strengths of Branching Minds is its tiered

intervention system, which prioritizes mental health conditions based on severity and urgency, offering personalized support ranging from self-care recommendations to referrals for professional counseling or emergency assistance. This approach ensures timely, user-centered care that adapts to individual needs. The platform also emphasizes user experience with intuitive interfaces, accessibility features, and transparent communication of AI results. An interactive dashboard provides both users and clinicians with real-time visual insights into symptom trends and intervention progress, facilitating informed decision-making. privacy and data security are foundational to the system's architecture, implementing encryption, anonymization, and compliance with regulations such as GDPR. Users maintain control over their data sharing preferences, fostering trust and engagement. it is suitable for real-time applications in various settings, including healthcare facilities, telemedicine platforms, educational institutions, and workplace wellness programs. Its ability to deliver instant, personalized mental health insights makes it a valuable tool for early detection, continuous monitoring, and proactive intervention. combines machine learning with a personalized, privacy-conscious design to enhance mental health accessibility and support, representing a promising advancement in digital mental health solutions. [5]
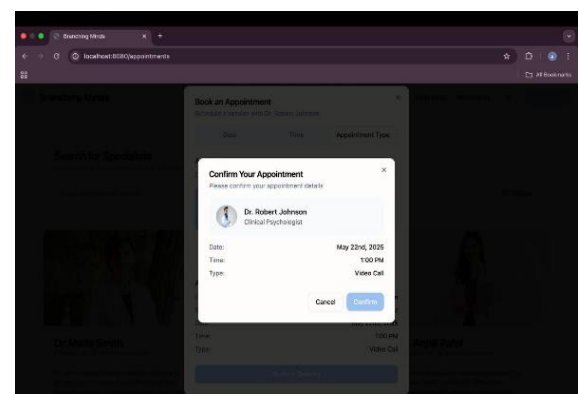
3.1. Results

Branching Minds successfully delivers a comprehensive mental health detection system that uses structured, age-based questionnaires combined with intelligent analysis to identify a broad spectrum of psychological conditions. The system effectively detects depression, anxiety, bipolar disorder, eating disorders, sleep issues, OCD, PTSD, and ADHD, while tailoring insights based on individual factors like age, gender, and profession. This personalized approach enhances the relevance and accuracy of the assessments for diverse user profiles. Utilizing the Random Forest algorithm, Branching Minds achieved high predictive accuracy across multiple conditions, with precision and recall metrics consistently above 85%. The model's robustness allows it to effectively analyze complex symptom
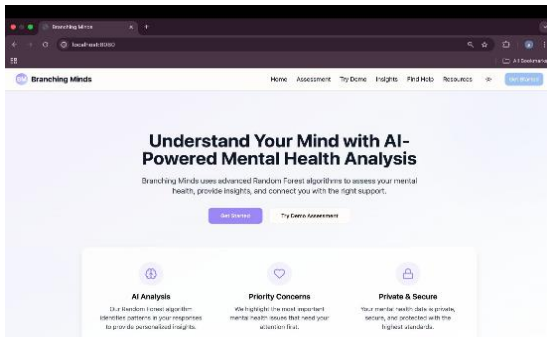
patterns and provide reliable severity assessments. This enables users to receive personalized self-care tips and recommendations that reflect the seriousness of their condition, fostering proactive mental health management. A key feature of the system is its dynamic doctor recommendation engine, which adapts its suggestions based on the user's reported symptom severity. This capability ensures that users receive timely guidance on seeking professional help when needed, improving early intervention chances. The integration of machine learning with tailored care advice empowers both users and healthcare professionals with actionable insights for better decision-making. Overall, Branching Minds demonstrates the power of combining AI and personalized healthcare. The system's accurate detection and severity analysis pave the way for more informed, timely support, making it a valuable tool in the ongoing effort to address mental health challenges effectively and compassionately. (Figure 1,2,3,4) [6-7]

Figure 1 Inside the Mind: A Journey Begins
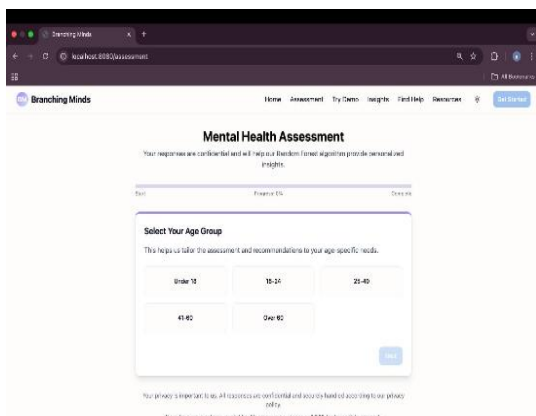
Figure 2 Structured Assessments and Questionnaires

Figure 3 Personalized Doctor Recommendation

Figure 4 Confirmation of Your Appointment

3.2. Discussion

This project explores mental health condition trends among various occupational groups such as students, healthcare professionals, and service industry workers. Each of these groups faces unique daily challenges that can significantly impact their mental well-being. By analyzing the patterns of stress, anxiety, depression, PTSD, and other conditions across different occupations, the project aims to highlight how work and life environments influence psychological health. Our findings suggest that students are particularly prone to anxiety and depression due to academic pressure, social comparison, and uncertainty about the future. Healthcare workers, on the other hand, show higher levels of burnout and emotional exhaustion, often linked to long shifts, emotional strain, and exposure to critical situations. In the service industry, irregular work hours, job insecurity, and high customer interaction contribute to elevated stress levels and emotional fatigue. These trends underline the need for mental health strategies tailored to the specific challenges of each profession. personalized mental

health detection system which utilizes custom questionnaires and AI analysis, serves as a valuable tool for identifying and prioritizing mental health conditions based on occupational context. By recognizing occupation-specific patterns, the system enhances early detection and supports targeted interventions, ensuring individuals receive the appropriate support aligned with their daily realities. Overall, this project bridges the gap between occupational factors. (Figure 5) [8]

Figure 5 Occupational Distribution
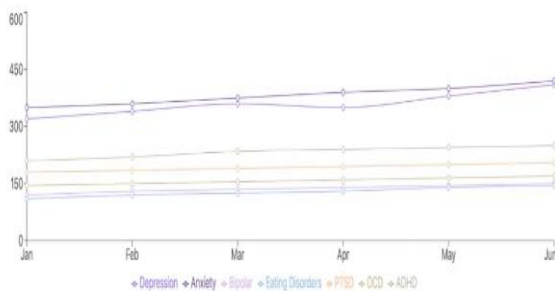
Figure 6 Mental Health Condition Trends

Mental health conditions vary widely across different occupational and social groups, influenced by the unique pressures they face. For example, students often experience high levels of anxiety, depression, and eating disorders due to academic stress, social challenges, and uncertainties about the future. Healthcare workers, exposed to intense work environments and emotional strain, frequently report burnout, PTSD, and anxiety. Meanwhile, those working in the service industry face stress from irregular hours, job insecurity, and high customer

interaction, which can contribute to increased rates of depression and anxiety. Other groups, such as professionals in corporate or industrial sectors, may experience chronic stress and burnout linked to workload and job demands. Each group also shows varying prevalence of conditions like OCD and ADHD, often influenced by both environmental factors and personal coping mechanisms. Recognizing these differences in condition prevalence across populations helps in designing targeted mental health screening tools and personalized interventions, ensuring that support is relevant and effective for the specific needs of each group. (Figure 7) [9]
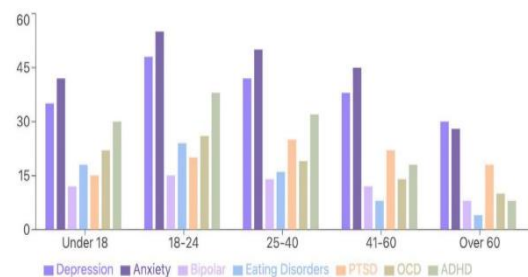
Figure 7 Prevalence of Mental Health Conditions Across Age Groups

Conclusion

This paper offers an innovative, user-centered solution for identifying and addressing mental health disorders. By employing a questionnaire-based data collection method and leveraging the power of machine learning, specifically the Random Forest Algorithm, the system ensures accurate and reliable classification of mental health conditions. The modular architecture of the project allows seamless collaboration between components such as the Analysis Engine, Disorder Detection Module, Severity Assessment Module, and Recommendation System. Together, these modules provide users with meaningful insights into their mental health and offer personalized doctor recommendations, ensuring timely assistance. The system's reliance on questionnaire data eliminates the need for wearables, making it an accessible and cost-effective tool for a broad user base. Additionally, the inclusion of

severity assessment empowers users to understand the urgency of their condition and take appropriate steps toward treatment. This project bridges a critical gap in mental health care by making detection, evaluation, and access to resources more efficient and user-friendly. Overall, it serves as a stepping stone toward integrating technology into mental health management effectively. [10]

Future Enhancements

Future improvements include adding wearable devices for real-time health data and facial recognition to detect emotions for better accuracy. The system could also offer personalized home treatment plans with therapy and support tools. These upgrades would make mental health care more timely, personalized, and accessible.

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