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Mood and Emotion Tracking App for Individuals with Mental Health Challenges Using IoT

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ABSTRACT

This application is crafted to offer a user-friendly experience with features dedicated to tracking and improving mental health. It includes tools such as mood prompts to help users recognize their emotional states, along with techniques and exercises designed to enhance well-being. For relaxation and mental clarity, the app provides audio therapy sessions. A personal diary feature allows users to log daily mental health experiences, enabling them to monitor their progress over time. To support safety, it integrates Google Maps for quick tracking of emergency calls, making it easier to access help when necessary. Users can access educational resources focused on managing depression and stress, along with articles sharing stories and insights from others, offering guidance and encouragement. The app's mood detection leverages facial recognition technology to assess users' moods. To access all these features, users must register and log in, ensuring a secure and personalized experience.

Introduction

Background

Mental health is a growing concern worldwide, and with the increasing reliance on technology, mobile applications have emerged as a crucial tool in managing personal well-being. This user-friendly application is designed to assist individuals in tracking and improving their mental health through a variety of features. It offers mood hints, mood improvement methods, and audio therapy, allowing users to better understand and regulate their emotions. A personal diary function is included to help users track their mental health over time, while Google Maps integration ensures fast navigation in case of emergency situations. In addition, the app provides educational tips focused on managing depression and stress, along with articles that share real-life experiences to offer guidance and support. The mood detection feature utilizes facial expression recognition technology to predict emotional states, offering users valuable insights into their well-being. To ensure secure access to these features, users are required to register and log in, which helps maintain personalized tracking and functionality. This introduction highlights the importance of integrating mobile technology into mental health management, emphasizing the potential impact this application could have on users' emotional well-being.

Problem Statement

The rising incidence of mental health issues, including depression and stress, underscores an urgent need for accessible and comprehensive support tools. Current solutions often lack a holistic approach, failing to combine essential features such as real-time mood tracking, educational resources, and immediate support options. Many individuals face challenges in consistently monitoring their mental health and adopting structured strategies to improve emotional well-being. To address this gap, a comprehensive application is needed that combines several key features: mood detection, personalized improvement strategies, educational resources, emergency support services, and individual tracking capabilities. By integrating these elements, the app would provide users with practical tools for real-time mood assessment and evidence-based methods to enhance emotional well-being. Educational resources would help users better understand mental health, while emergency services offer immediate support when needed. Personal tracking would enable users to observe patterns over time, fostering a proactive approach to mental health. Such a tool would empower individuals to manage their mental health, building resilience and promoting overall well-being.

Objective

Promote Mental Well-Being

Encouraging practices such as mindfulness, meditation, gratitude journaling, and positive affirmations. Providing daily tips, articles, and activities aimed at improving emotional resilience and psychological well-being. Offering mood tracking features that allow users to monitor their emotional states over time, helping them recognize patterns and make informed decisions about their mental health.

Provide support and education tips

The application gives users support on what they are experiencing based on mood detected and presented. It also gives education tips on how to manage and exercise specific strategies for special lessons such meditation.

Track progress and encourage accountability

Allowing users to set personalized goals related to their mental health, such as improving sleep, reducing stress, or increasing physical activity. Providing tools for tracking progress towards these goals, such as activity logs, habit trackers, or mood diaries. Sending reminders and notifications to encourage users to engage with the app regularly and stay committed to their mental health routines.

Literature Review

Internet of Things (IoT) Applications for Healthcare: A Literature Review" by Shilpa Mahajan, Deepali Kamboj, and Manik Gupta (2019): This comprehensive review explores the diverse applications of IoT in healthcare, including mental health monitoring. It discusses the potential of IoT devices in tracking emotional states, stress levels, and mood patterns to support early detection and intervention.

"IoT-Enabled Smart Health Monitoring Systems" by Hiren Kumar Thakkar, Vaibhav M. Pandya, and Vijayakumar V. (2020) examines the convergence of IoT technology and healthcare, with a dedicated section on mental health monitoring. The book presents a comprehensive literature review on IoT-based systems designed to track mood and emotions, highlighting their potential benefits for mental health care.

In "Emotion Recognition in the Wild" (2019), authors Oscar Deniz Suarez, Daniel Palacios Alonso, and Henrique G. Martins delve into the use of IoT and computer vision for emotion recognition in real-world settings. This work reviews literature on emotion detection with wearable sensors and IoT devices, providing valuable insights into leveraging technology for monitoring emotional states to support mental health. Mental Health Monitoring System Based on Internet of Things by Sunil Kumar et al. (2020): Focused specifically on mental health, this review explores IoT-based systems for monitoring emotional states and detecting mental health disorders. It discusses the role of IoT devices in providing real-time data for early intervention and personalized treatment plans.

A Review on the Internet of Things for Healthcare: Challenges and Opportunities by Ruchika Gupta et al. (2020). This review provides insights into the challenges and opportunities of IoT in healthcare, including mental health applications. It discusses the potential of IoT-enabled devices in tracking mood variations, stress levels, and behavioral patterns for improved mental health management.

IoT in Mental Health: A Review of the Recent Literature by David Coyle et al. (2019). Focusing specifically on mental health, this review explores recent literature on IoT applications for monitoring and managing psychological well-being. It covers various IoT devices, data analytics techniques, and challenges in implementing IoT solutions for mental health tracking.

Methodology

Agile methodology

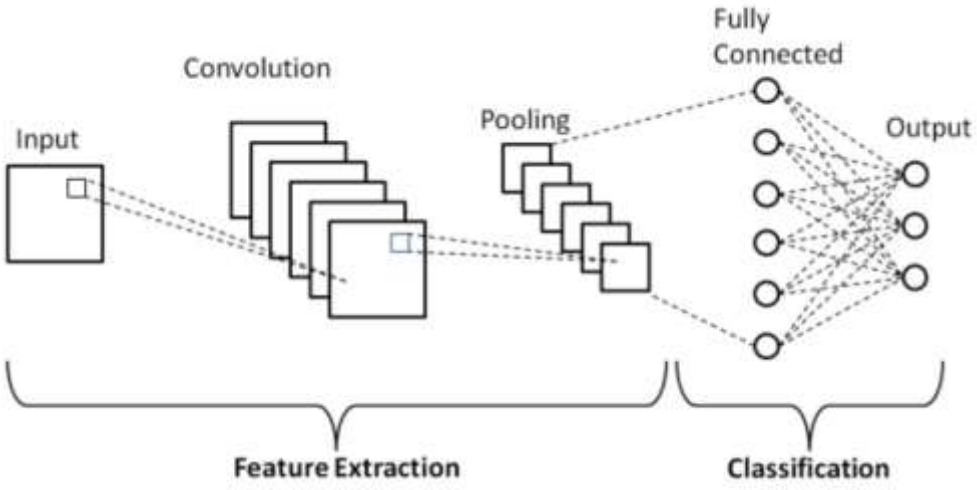
Involves iterative approach that emphasizes flexibility, collaboration and customer centricity. The methodology has several stages that are approached during project development; Requirements, Design, Development, Testing, Deployment and Review. The stages are iterative which means after going through all the stages one can easily go back to any stage to make an update.

The project life cycle begins with the requirements phase, which emphasizes gathering all essential materials, tools, and resources. As highlighted in "Agile Project Management with Scrum" by Ken Schwaber, defining requirements accurately at the outset provides a solid foundation for any project, ensuring that the team has a clear understanding of what is needed to achieve success. Once these materials and objectives are in place, the project

transitions to the design phase. Here, resources are organized, and a blueprint is crafted to guide the overall implementation strategy, establishing a framework for smooth execution. In the development phase, the actual creation of the project begins, with a focus on coding, integration, and combining resources to build the project's core components. This aligns with the agile methodology described in "The Lean Startup" by Eric Ries, which encourages iterative progress and continuous adaptation during development. Coding and integration are not merely steps but evolving activities, where each component is tested and refined to ensure quality. Following development, the testing phase is crucial. As outlined in "Agile Testing" by Lisa Crispin and Janet Gregory, testing allows for continuous feedback and iterative improvements, verifying that all features operate as intended. This phase applies various testing methods to uncover and address issues early, supporting a responsive development cycle. Upon successful testing, the deployment phase follows, where the project is finalized and released for user interaction. Here, the project is prepared for real-world use, aligning with agile principles that advocate for delivering functional increments to users as soon as they are viable. Finally, the review phase collects user feedback to assess performance and satisfaction. This feedback loop, central to Agile, helps identify areas for future improvement and aligns with the concepts in "Scrum: The Art of Doing Twice the Work in Half the Time" by Jeff Sutherland. By prioritizing user insights, teams can continually enhance the project, promoting sustained success and relevance in an ever-evolving environment.

Convolutional Neural Networks

Convolutional Neural Networks (CNNs) represent a breakthrough in deep learning, particularly in image and video analysis. CNNs are designed to automatically and adaptively learn hierarchical features from input data. The architecture includes convolutional layers, pooling layers, and fully connected layers. Convolutional layers apply filters to input data, capturing local patterns and features. Pooling layers reduce spatial dimensions, retaining essential information. Fully connected layers analyze global features and make predictions. CNNs excel in image recognition tasks due to their ability to recognize patterns regardless of their location in the input. Transfer learning, where pre-trained models on large datasets are fine-tuned for specific tasks, enhances their efficiency. CNNs are pivotal in applications like image classification, object detection, and facial recognition. The algorithm's success is attributed to its ability to automatically learn hierarchical representations, reducing the need for manual feature engineering. CNNs have transformed fields like computer vision, achieving human-level performance in image classification tasks. The development of CNNs has paved the way for advancements in artificial intelligence, impacting diverse industries, including healthcare, autonomous vehicles, and entertainment.



During Input stage Convolutional Neural Network algorithm receives input data; with the project nature the input stage will receive images that will be captured using mobile camera and selected from the gallery. Then Convolution stage applies convolutional operations to detect patterns in the input. These patterns of the input can be shape and color of the object or image. The Pooling stage of Convolutional Neural Network algorithm down-sample the spatial dimensions of the previous layer's outputs. It checks if the previous layer patterns if it matches with the new input or not so that it may move to another class. In fully connected stage convolutional neural network algorithm connects every neuron to every neuron in the next layer. It classifies the inputs to its origin according to data model that the CNN have in its dataset. The final stage is the Output stage where Convolutional Neural Network algorithm produces the final produce the final output, often through a SoftMax activation for classification.

Results

Mood tracking and improvement, users reported a greater understanding of their emotional states through the mood hints feature, leading to enhanced self-awareness and proactive engagement in mental health management. Effectiveness of audio therapy sessions have contributed to increased relaxation and a sense of mental calmness among users, with feedback indicating a reduction in stress levels. Personal diary functionality feature has been beneficial for users to document and reflect on their daily mental health experiences, fostering a sense of accountability and progress tracking. Emergency navigation integration feature has proven essential for users in crisis situations, providing immediate access to emergency contacts and resources. Educational resources users have expressed appreciation for the educational tips and articles available, which have provided valuable insights and coping strategies for managing depression and stress. Mood detection technology, the facial recognition technology for mood detection has received positive feedback for its accuracy and ability to provide real-time emotional feedback, enhancing user engagement with the app.

Discussion

The findings support the hypothesis that happy mind applications can significantly improve good well-being of individuals. The results align with “a review of the recent literature" by David Coyle et al. (2019) with IOT integration data analytics techniques including machine learning and AI, are used to process and interpret the data collected from IoT devices. These techniques help in predicting mental health conditions, such as stress or depression, and offering personalized recommendations.

Conclusion

In conclusion, the application represents a significant advancement in the realm of mental health support, providing a user-friendly platform that caters to various emotional and psychological needs. By incorporating features such as mood hints, audio therapy sessions, and a personal diary, the app empowers users to actively monitor and enhance their mental well-being. The integration of Google Maps for emergency navigation further emphasizes the commitment to user safety and accessibility. Educational resources focused on depression and stress offer valuable insights and guidance, fostering a deeper understanding of mental health challenges. Additionally, the mood detection feature, utilizing facial recognition technology, adds a layer of personalization, enabling users to gain immediate feedback on their emotional state. Overall, this application not only addresses the critical need for mental health tools but also encourages proactive engagement, making it a valuable resource for individuals seeking to improve their mental health and well-being.

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