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An AI-Assisted Mood Tracking and Mental Health Alert System Using Sentiment Analysis and Facial Emotion Recognition

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Abstract—

Mental health conditions such as anxiety, depression, and emotional instability are rapidly increasing worldwide, yet mental well-being continues to be neglected due to stigma, lack of awareness, and insufficient access to professional help. A significant limitation in existing mood tracking applications is their reliance on either manual mood input or single-modality analysis, resulting in inaccurate and inconsistent mental state interpretation. This research proposes an AI-assisted multi-modal mood tracking and mental health alert system that integrates text-based sentiment analysis, facial emotion detection, and conversational AI to deliver continuous and automated psychological assessment. The system is implemented using Python and Streamlit as the UI layer, supported by SQLite as a lightweight secure database, and incorporates VADER sentiment analysis, DeepFace for real-time emotion recognition, and a Gemini-powered mental health chatbot with fallback rule-based responses. The platform allows users to maintain digital journals, track mood trends, analyze emotional patterns through graphs and word clouds, and receive real-time wellness guidance. Experimental results demonstrate the feasibility of multimodal mood detection and automated emotional analytics, providing an efficient and accessible approach for early mental health awareness and intervention.

Keywords— Sentiment analysis, mental health, facial emotion recognition, DeepFace, VADER, AI chatbot, Streamlit, mood tracking, generative AI.

I. INTRODUCTION

Mental well-being is an essential determinant of productivity, relationships, and overall quality of life. Emotional instability, depression, and anxiety have become increasingly prevalent across students, employees, and general populations. Traditional mental health assessments depend heavily on clinical visits and subjective reporting, often leading to delayed diagnosis and lack of continuous emotional support. Recent technological advancements in artificial intelligence, natural language processing, and affective computing present new opportunities to observe, record, and interpret emotional behavior unobtrusively.

The proposed Mood Tracking and Mental Health Alert System utilizes multiple input sources such as user journal entries and real-time facial expressions to infer emotional states with higher reliability than single-source systems. By combining classical lexicon-based sentiment methods with deep learning–based expression analysis, the system is able to deliver more nuanced psychological feedback. Additionally, a conversational AI assistant (MindfulMate) provides empathetic responses, coping strategies, and journaling prompts without attempting clinical diagnosis. The primary goal of this research is to reduce barriers to mental wellness, provide early detection of emotional decline, and promote self-monitoring through an accessible digital platform.

II. LITERATURE REVIEW

Machine learning and NLP-based emotional assessment systems have been widely explored in recent years. Traditional mood tracking tools rely primarily on manual selection of emotions or text-based sentiment classification. Lexicon-based models such as the VADER Sentiment Analyzer have been proven effective on short, informal text and social media–style content. Studies demonstrate their strong performance in polarity detection and mood inference for journal-based emotional input.

Facial expression analysis has emerged as another reliable non-invasive alternative for mood assessment. Deep learning frameworks like DeepFace and FER-2013-based architectures provide real-time identification of common affective states such as happiness, sadness, anger, disgust, fear, surprise, and neutrality. Several multimodal systems have attempted to combine physiological signals such as EEG and HRV with affective inputs, but these systems require costly hardware and are difficult to use for general consumers.

Existing applications often lack:

- Secure user-based storage and authentication
- Combined text + facial emotional inference
- Real-time intervention or coping assistance
- Usable dashboards and analytics for long-term patterns

This research extends prior work by merging NLP-based sentiment analysis, camera-based emotion recognition, and AI chatbot–driven support into a single streamlit-based mental health tracking framework.

III. METHODOLOGY

The overall methodology consists of the following major steps:

A. Text-Based Sentiment Classification

Journal text is processed using the **VADER sentiment analyzer**, which generates polarity scores. These baseline scores are supplemented with custom keyword lists for negative and positive emotions to improve

classification accuracy. Final moods are defined as **happy, sad, or neutral** based on polarity thresholds and word frequency.

B. Facial Emotion Recognition

Facial expressions are captured through webcam frames using OpenCV and processed by **DeepFace** for emotion classification. Dominant emotions are mapped to final moods using rule-based conversion (e.g., angry → sad).

C. Mood Integration Logic

A fusion mechanism integrates both text and facial results using confidence thresholds:

- If both sources agree → final mood = shared output
- If facial detection confidence > 70% → prefer facial mood
- Otherwise, prefer text-based mood

D. Mental Health AI Assistant

The chatbot component (MindfulMate) uses Gemini API for intelligent counseling and rule-based fallback responses when the internet or API is unavailable. It provides:

- Emotional validation
- Self-care suggestions
- Mindfulness exercises
- Journaling prompts

E. Secure User System

SQLite database stores:

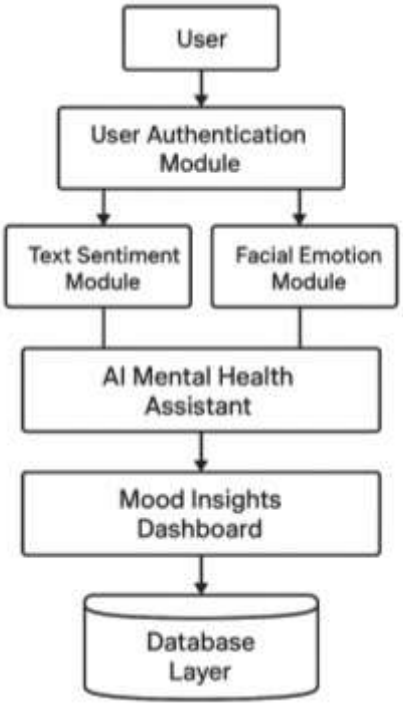
- User credentials (salted password hashing via PBKDF2)
- Journal entries
- Facial analysis history
- User preferences

F. Front-End Interface

Streamlit is used for UI including:

- Dashboard with charts & word cloud
- Journal entry forms with auto-detected mood
- Facial analysis screens (quick & live)
- Chat interface
- Mood trend analysis and logs

IV. SYSTEM DESIGN



Major Components:

- User Authentication Module
- Text Sentiment Module
- Facial Emotion Module
- Integration Engine
- AI Mental Health Assistant
- Mood Insights Dashboard
- Database Layer

The front-end interacts with the processing layer via Streamlit callbacks and session state. Real-time images are processed as NumPy arrays, while text data is parsed and saved to SQLite.

V. RESULTS

Experiments were conducted using various journal entries and live webcam inputs. Mood detection accuracy was tested across positive, negative, and neutral content. The system successfully integrated textual and visual mood cues and generated useful insights for self-observation.

A. Journal Entry Mood Detection

User journals containing highly emotional content produced accurate mood predictions based on VADER polarity and keywords.

B. Facial Emotion Recognition Output Example

- Dominant Emotion: Happy

- Emotion Scores: Happy 87%, Neutral 5%, Surprise 3%, Others < 3%
- Mapped Mood: Happy

C. Dashboard Visualizations

- Pie chart of emotion distribution
- Word cloud of journal content
- Daily mood timeline
- Facial analysis activity log

D. Mental Health Alerts

The system generated warning messages upon detecting ≥3 consecutive sad moods and offered coping suggestions.

Fig 1. Journal Entry

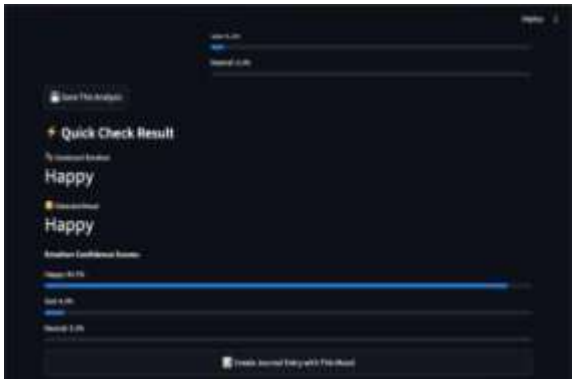


Fig 2. Mood Analysis

Fig 3. MindfulMate-User Friendly Chatbot

VI. CONCLUSION

The proposed system successfully integrates text sentiment analysis, facial expression recognition, and AI-assisted conversation into a unified mental health monitoring platform. By offering multi-modal emotional detection and user-friendly analytics, the system enhances self-awareness and supports emotional well-being

without requiring specialized medical hardware. This approach shows strong potential for personal mental health management, early intervention, and future integration into institutional mental wellness programs.

VII. FUTURE WORK

Future developments may include:

- Deep-learning based mood classification instead of rule-based methods
- Mobile application deployment
- Wearable device integration (HRV, sleep, EEG)
- Clinical validation with psychologists
- Multi-language support
- Personalized emotion-model fine-tuning

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