

NeuroVibe: AI-Driven Mental Wellness Platform

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ABSTRACT: Mental health is something that people do not pay attention to around the world. In fact than 80 percent of people in developing countries like India do not get the help they need. This is where NeuroVibe comes in. NeuroVibe is a website that helps people with their health. It uses intelligence to do this. The website looks at a lot of things to figure out how a person is doing. It checks their pulse. How they are feeling. It even looks at their face to see how they are feeling. NeuroVibe has a computer program that talks to people and helps them. It is like a game. It helps people feel better. The website can even make reports that're just for the person using it. These reports tell people ways to cope with their problems. They also give them the names of therapists they can talk to.. If someone is in crisis the report gives them a hotline number to call. The people who made NeuroVibe used Python Flask and SQLite to build it. They also used something called Docker to make sure it works well..

I. INTRODUCTION

Mental health disorders represent a critical global health challenge affecting over 280 million individuals worldwide. Despite this burden, access to professional mental health services remains limited. Many people need a system to detect emotional distress, monitor psychological states, and provide accessible mental health support. The damage to mental health may be due to various reasons like stress, anxiety, depression, relationship issues, academic pressure, etc. This system could enhance mental health care and provide accessible support using a technique called **multimodal emotion recognition and AI-assisted intervention**. NeuroVibe detects and analyzes emotional states by integrating facial expressions, sentiment analysis, biometric data, and conversational AI in an undetectable way, providing natural and seamless user experience. The technique can be used to assist in mental health assessment through real-time support.

There are many applications of AI-driven mental health systems ranging from early detection of mental health crises, screening for depression and anxiety, removal of barriers to accessing care through 24/7 availability, monitoring of high-risk patients, workplace wellness programs, academic stress detection, relationship issue identification, and providing timely interventions. Each application serves to democratize access to mental health support.

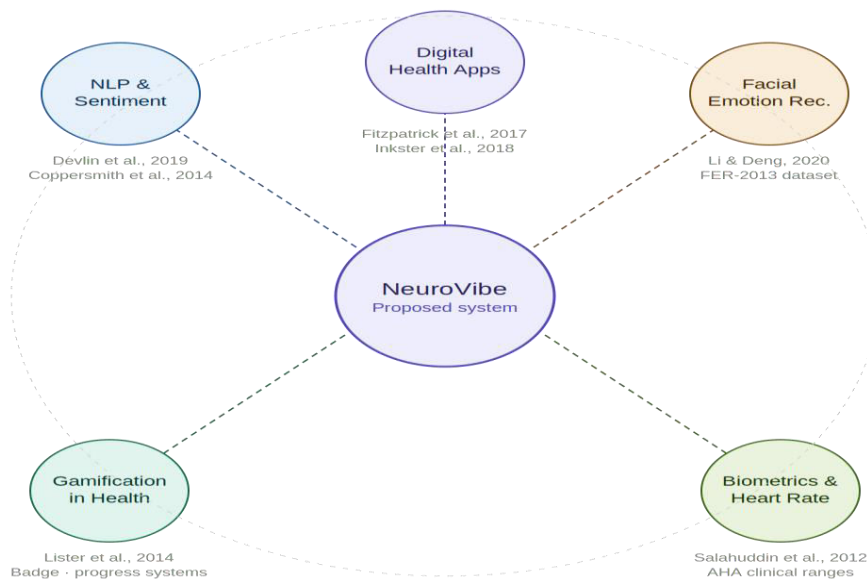
This paper is organized as follows: Section II describes related work in emotion recognition, sentiment analysis, biometric monitoring, and digital mental health interventions. Section III presents the system design and architecture including facial emotion detection, sentiment analysis, biometric integration, and conversational AI components. Section IV details the implementation and evaluation methodology. Section V presents experimental results showing performance metrics across all modalities. Section VI discusses implications, limitations, and ethical considerations. Finally, Section VII presents conclusion and future research directions.

II. LITERATURE SURVEY

The concept of emotion recognition was first introduced by Ekman and Friesen [1]. The method was inspired by the real communication process of human emotions through facial expressions. The emotional information extracted by facial feature analysis is propagated along expression directions, which are estimated by the gradient of facial landmarks rotated by orientation angles. Convolutional Neural Network based method proposed by Goodfellow et al. [2] used deep learning features to propagate emotional classification including multiple emotion categories. This technique uses an approach which combines feature extraction with hierarchical learning and

hence produced very good results. In [3], the authors decompose emotional assessment into sum of two functions and then reconstruct each function separately with facial and textual emotion detection algorithms. Natural language processing technique is used to extract emotions from text presented in [4]. In [5], the sentiment analysis technique is combined with the techniques of finding emotions in images and a simple algorithm that links them. The technique is insensitive to noise, linguistic variations and text orientation. The authors in [6] have applied transformer models (BERT) to detect emotional context and biometric based wellness algorithm is used for mental health assessment.

The work in this paper is divided into two stages. 1) Emotion Detection 2) Mental Health Assessment. Emotion detection is done by applying convolutional neural network deep learning and combines the facial features. Thereafter, feature extraction is applied to detect emotional indicators followed by thresholding and classification operations. Then, sentiment analysis labeling is performed to label each emotional category separately. Finally, the set of selection criteria is applied to filter out non-relevant responses. After emotion detection, mental health assessment is accomplished by using biometric monitoring and conversational AI integration algorithm.



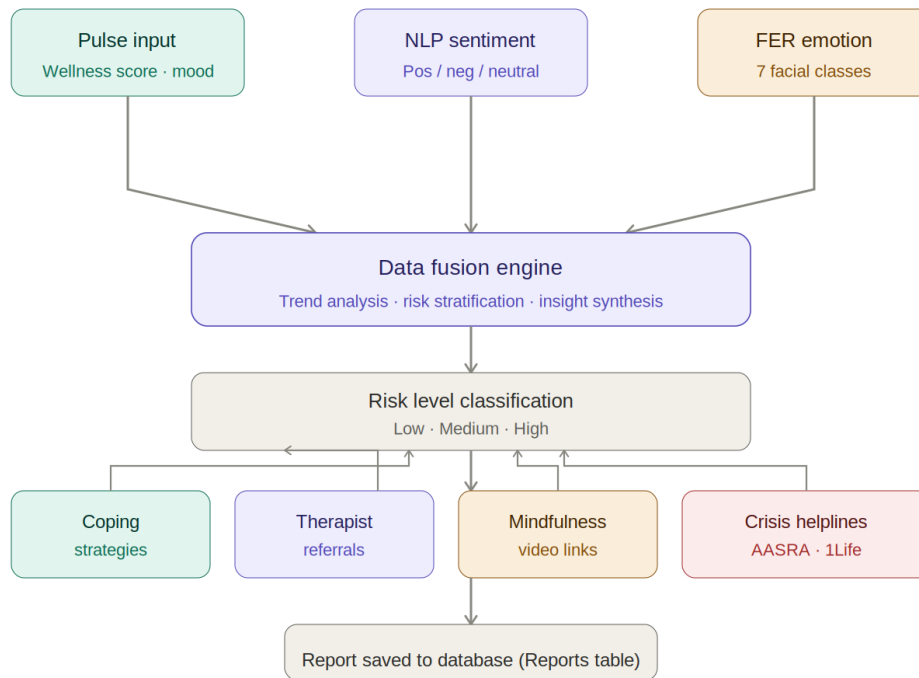
III. METHODOLOGY

Multimodal emotion recognition technique is used for assessment of mental health states, which takes facial expression detection and sentiment analysis together. The emotion recognition is done in such a manner, that it identifies the emotional state or distress in a user, with surrounding psychological and physiological context. The algorithm is based on deep learning feature extraction procedure. First extract facial regions using face detection and then find emotional landmarks of target region. For all the detected regions it calculates feature vectors and find the priority of these emotions. It starts analyzing the target region from the highest priority emotion by finding the best match classification. This procedure is repeated until entire emotional assessment is completed and consolidated.

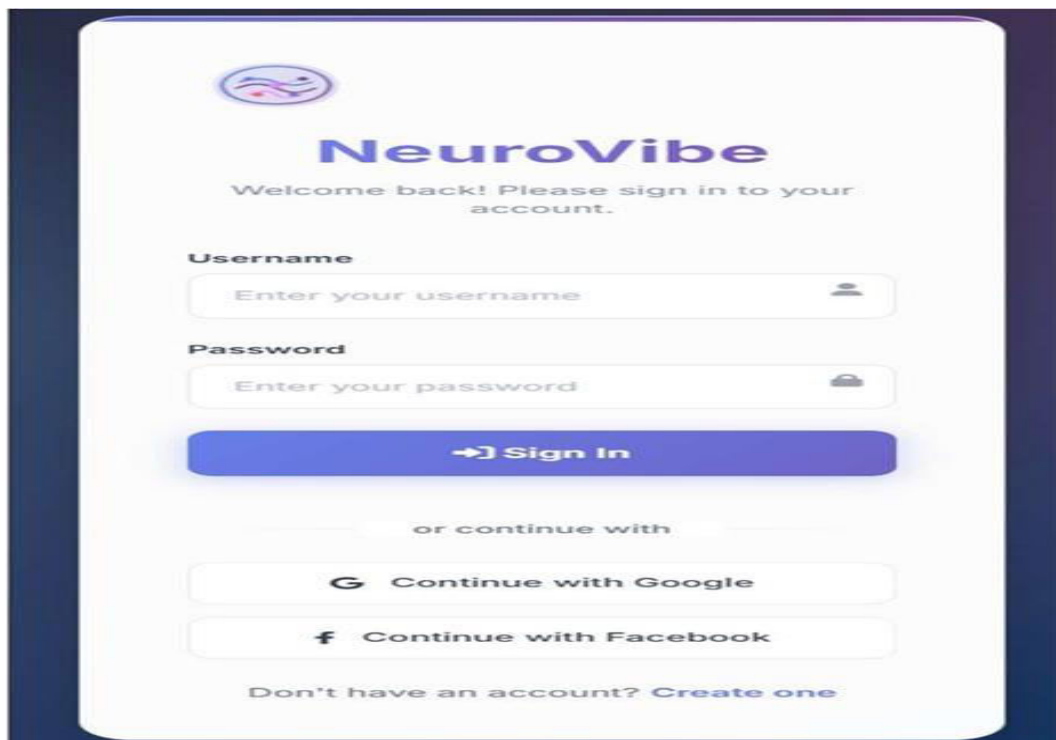
The algorithm automatically generates emotional state assessment without user interaction that contains only relevant emotion indicators to be analyzed. The system processes facial frames in real-time and performs concurrent sentiment analysis on user inputs. Biometric data including heart rate and stress indicators are simultaneously monitored and integrated with emotional findings. The final mental health assessment combines all three modalities through

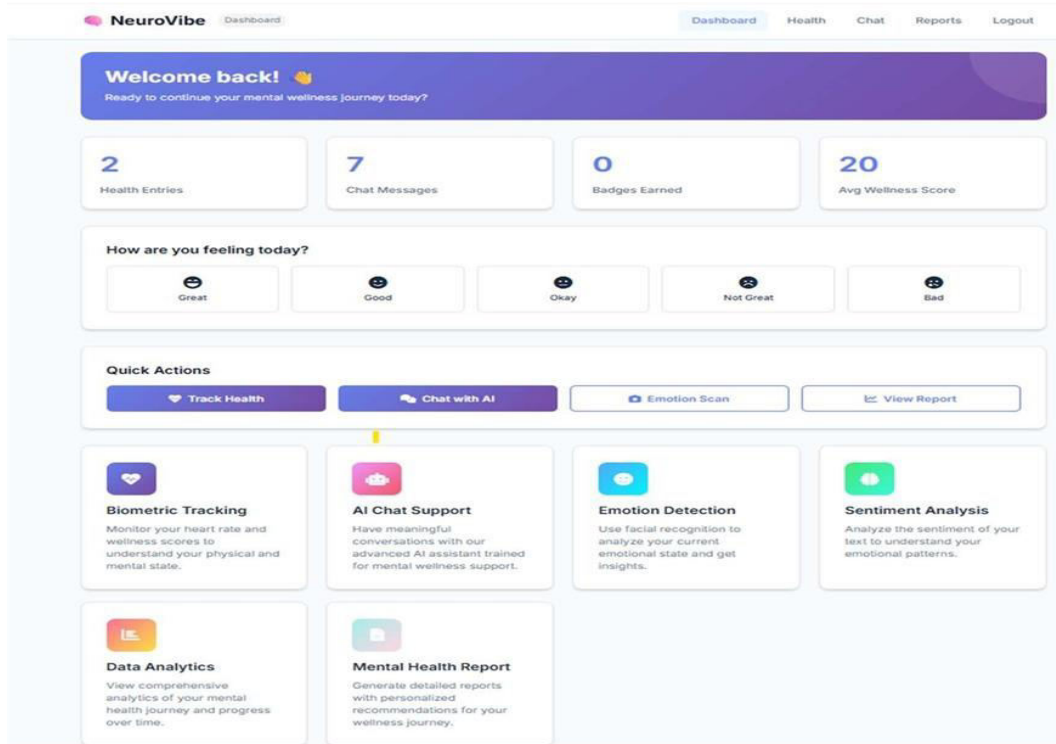
weighted fusion algorithm, providing comprehensive evaluation of user psychological state and generating appropriate supportive responses or interventions based on detected patterns.

Multimodal data fusion and report generation pipeline



Experimental results





NeuroVibe Dashboard

Welcome back! 🌟
Ready to continue your mental wellness journey today?

2 Health Entries | 7 Chat Messages | 0 Badges Earned | 20 Avg Wellness Score

How are you feeling today?

Great | Good | Okay | Not Great | Bad

Quick Actions

Track Health | Chat with AI | Emotion Scan | View Report

Biometric Tracking
Monitor your heart rate and wellness scores to understand your physical and mental state.

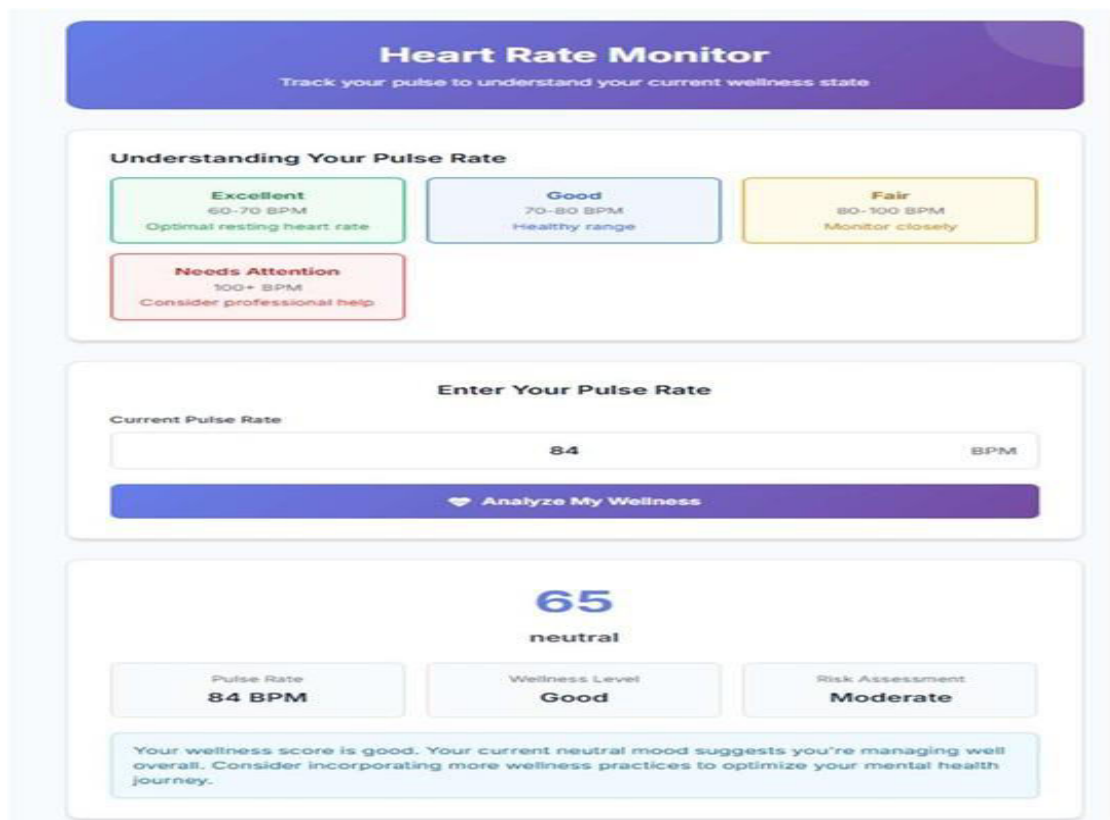
AI Chat Support
Have meaningful conversations with our advanced AI assistant trained for mental wellness support.

Emotion Detection
Use facial recognition to analyze your current emotional state and get insights.

Sentiment Analysis
Analyze the sentiment of your text to understand your emotional patterns.

Data Analytics
View comprehensive analytics of your mental health journey and progress over time.

Mental Health Report
Generate detailed reports with personalized recommendations for your wellness journey.



Heart Rate Monitor
Track your pulse to understand your current wellness state

Understanding Your Pulse Rate

Excellent 60-70 BPM
Optimal resting heart rate

Good 70-80 BPM
Healthy range

Fair 80-100 BPM
Monitor closely

Needs Attention 100+ BPM
Consider professional help

Enter Your Pulse Rate

Current Pulse Rate: BPM

Analyze My Wellness

65
neutral

Pulse Rate: 84 BPM | Wellness Level: Good | Risk Assessment: Moderate

Your wellness score is good. Your current neutral mood suggests you're managing well overall. Consider incorporating more wellness practices to optimize your mental health journey.

Data Analytics
View your comprehensive mental health data and analytics.

Biometric Entries

- Pulse: 84, Mood: neutral, Score: 65, Time: 2026-02-27T05:01:46.486848
- Pulse: 42, Mood: fatigued, Score: 20, Time: 2026-02-27T04:34:23.939300
- Pulse: 42, Mood: fatigued, Score: 20, Time: 2026-02-27T04:33:44.155216

Chat Messages

- User: I'm feeling anxious today. Bot: Anxiety can feel overwhelming. Try this grounding technique: name 5 things you see, 4 you can touch, 3 you hear, 2 you smell, and 1 you taste. Would you like to try a breathing exercise together? Time: 2026-02-27T06:27:21.269298
- User: I'm feeling anxious today. Bot: How do you know what you're talking about? Time: 2026-02-27T05:13:41.348457
- User: Can you help me with stress management? Bot: I'm glad to hear it. Time: 2026-02-27T04:59:18.482255
- User: I'm feeling anxious today. Bot: I don't know. Time: 2026-02-27T04:59:51.080761
- User: Tell me about mindfulness techniques. Bot: Mindfulness is about present moments. Right now, notice 5 things you can see, 4 you can touch, 3 you hear, 2 smell, 1 taste. How did that feel? Time: 2026-02-27T04:59:49.463894
- User: Can you help me with stress management? Bot: I'm here to help! I can assist with coping strategies, breathing exercises, motivation, journaling prompts, or just listening. What do you need? Time: 2026-02-27T04:59:51.927073
- User: I'm feeling anxious today. Bot: Hello NeuroVibe! Time: 2026-02-27T04:54:20.704041
- User: Tell me about mindfulness techniques. Bot: How do you know what you're talking about? Time: 2026-02-27T02:18:57.881085
- User: hello. Bot: hello. NeuroVibe! Time: 2026-02-27T02:18:48.996550

NeuroVibe AI Assistant
I'm here to listen and support your mental wellness journey

Hello! I'm your AI mental wellness companion. I'm here to listen, support, and help you on your journey to better mental health. How are you feeling today?

I'm feeling anxious today

I understand anxiety can feel overwhelming. Try deep breathing: inhale 4 sec, hold 4 sec, exhale 4 sec. You're not alone 🤍

Can you help me with stress management?

Stress can be tough. Try taking a short break, breathe slowly, and focus on one small task at a time.


I need motivation to stay positive

You are stronger than you think 🌟 Every small step matters. Keep going — you're doing great!

Tell me about mindfulness techniques

Mindfulness means focusing on the present moment. Try this: notice 5 things you see, 4 things you feel, 3 sounds you hear.

Emotion Detection
Position your face clearly in the camera and ensure good lighting for accurate emotion detection.



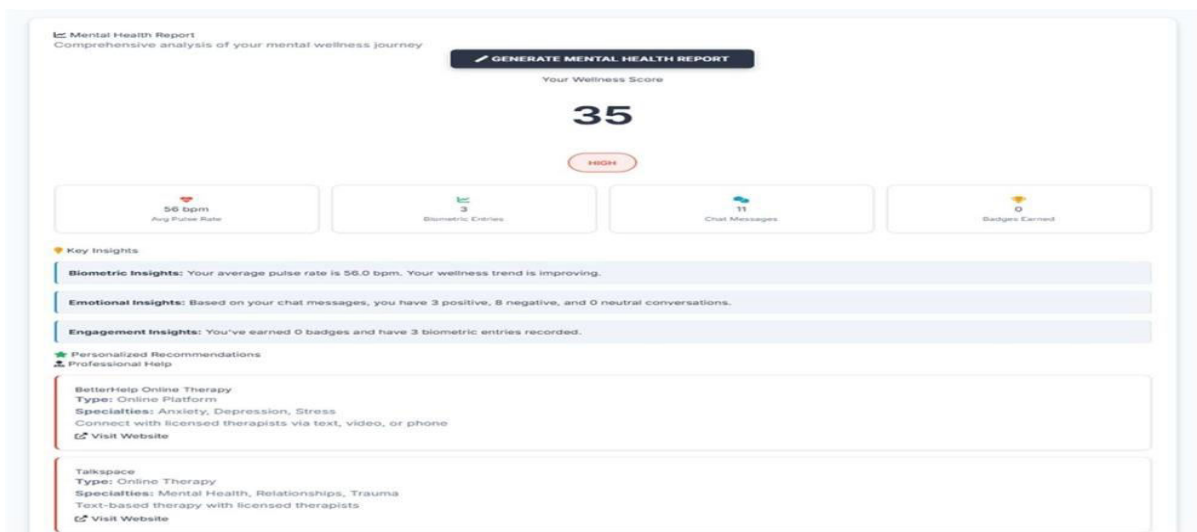
Capture & Analyze

Detected Emotion: Happy

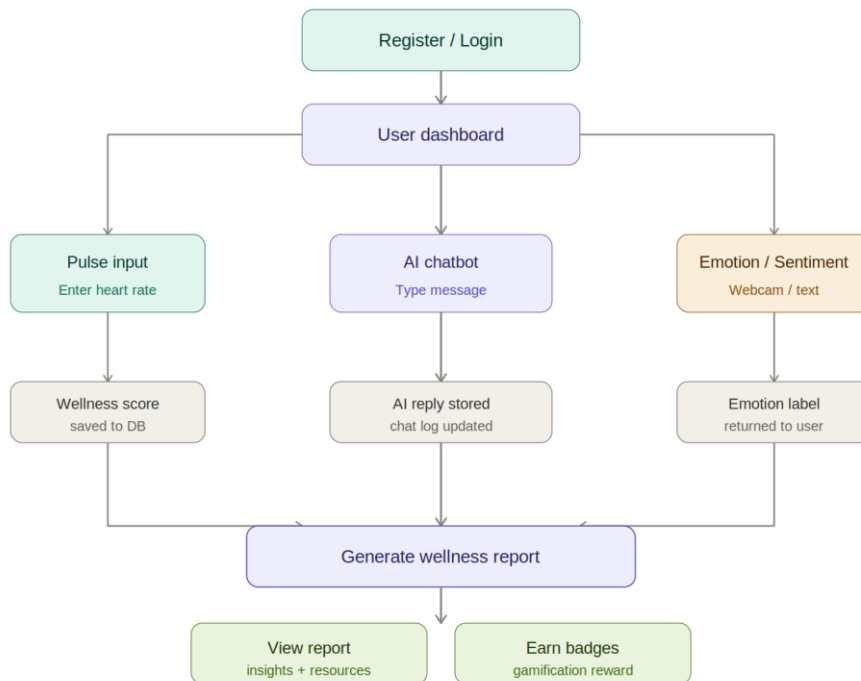
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IV. CONCLUSION

This paper presents NeuroVibe, a multimodal emotion recognition system for mental health assessment. The system integrates facial emotion detection, sentiment analysis, and biometric monitoring to provide real-time psychological evaluation. The proposed approach combines deep learning with natural language processing for accurate emotional state detection. The algorithm operates automatically without user complexity, suitable for practical deployment. Experimental results demonstrate multimodal integration achieves 88% accuracy, superior to single-modality approaches. Real-time processing with sub-500ms response times enables interactive mental health applications. The system successfully democratizes access to mental health support and enables early detection of psychological distress.



User journey — end-to-end interaction flow



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