

AI-Powered Precision Mental Wellness Analyzer

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1. Project Overview

The **AI-Powered Precision Mental Wellness Analyzer** is an intelligent, multimodal system designed to **monitor, analyze, and assess mental wellness indicators** using Artificial Intelligence and Machine Learning techniques.

The system integrates **text sentiment analysis, speech emotion recognition, facial expression analysis, and screen content monitoring** to generate a unified **mental wellness score**. By continuously observing user interactions, the system aims to provide **early detection of emotional distress and high-risk behavioral patterns**, enabling timely preventive intervention.

This project is developed as a **non-clinical, research-oriented wellness support system**, emphasizing ethical AI usage, privacy awareness, and responsible decision-making.

2. Key Benefits

Category	Description
Comprehensive Monitoring	Multimodal analysis combining text, voice, facial expressions, and screen content. Real-time processing every 15 seconds using a weighted scoring system for accurate assessment.
Early Risk Detection	Proactive identification of mental health risks with severity classification into Low, Medium, High, and Critical levels. Supports visual, browser, and voice-based alerts.
Personalized Support	AI-powered conversational companion delivering context-aware, adaptive recommendations tailored to the user’s current mental state.
Privacy & Security	Local data processing with no cloud storage. Real-time analysis without persistent data retention. Full user control to start or stop monitoring at any time.
Performance Optimization	Efficient resource utilization to prevent system overload. Cloud-ready architecture without external dependencies and a responsive, smooth user interface.

3. Technology Stack

Layer	Technologies
Programming Language	Python 3.10+
Backend Framework	Flask
Frontend	HTML, CSS, JavaScript
Machine Learning	Scikit-learn, Transformers
Computer Vision	OpenCV, MediaPipe
Audio Processing	Librosa, SpeechRecognition
OCR & NLP	Tesseract OCR, NLTK
Model Support	PyTorch / TensorFlow
Deployment	Localhost / Cloud-ready

4. System Architecture

The system follows a **modular layered architecture**:

- 1. **Input Layer**
 - Text input
 - Microphone audio
 - Webcam video
 - Screen capture
- 2. **Processing Layer**
 - Feature extraction
 - Signal normalization
 - AI inference
- 3. **Analysis Layer**
 - Emotion detection
 - Sentiment classification
 - Risk evaluation
- 4. **Decision Layer**
 - Wellness score generation
 - Alert triggering
- 5. **Presentation Layer**
 - Dashboard
 - Chatbot responses
 - Notifications

5. Workflow & Process Flow

- 1. User interaction is captured (text, speech, face, screen).
- 2. Individual AI models analyze each modality.
- 3. Emotional and behavioral indicators are extracted.
- 4. Outputs are passed to a **behavior synthesis engine**.
- 5. A consolidated **mental wellness score** is generated.
- 6. Based on thresholds:
 - Normal → Feedback
 - Moderate → Warning
 - Critical → Emergency guidance

6. Libraries & Dependencies

Core Backend & Framework Libraries

Layer	Library	Purpose
Backend Framework	Flask	Web framework for REST APIs
Backend Support	Flask-CORS	Enables cross-origin requests
Configuration	python-dotenv	Environment variable management
Database	SQLite	Lightweight logging & event storage

Machine Learning & AI Libraries

Category	Library	Purpose
NLP	transformers	DistilBERT for sentiment analysis
Deep Learning	torch	Backend engine for Transformers
ML Utilities	scikit-learn	Audio normalization (StandardScaler)
Numerical Ops	numpy	Vector & matrix operations
Conversational AI	openai	GPT-powered AI companion

Audio Processing Libraries

Category	Library	Purpose
Audio Analysis	librosa	Feature extraction (pitch, tempo, energy)
Audio I/O	soundfile	WAV file handling (cloud-safe)
Audio Backup	pydub	Fallback audio decoding

Computer Vision & Facial Analysis Libraries

Category	Library	Purpose
Vision Core	opencv-python	Face detection & preprocessing
Emotion Recognition	fer	Facial emotion classification
Face Detection	mtcnn	Optional high-accuracy detector
Image Processing	Pillow (PIL)	Image decoding & resizing

OCR & Screen Content Analysis Libraries

Category	Library	Purpose
OCR Engine	pytesseract	Primary OCR for screen text
OCR Fallback	easyocr	Backup OCR engine

Frontend & Web API Libraries

Category	Technology	Purpose
Frontend Structure	HTML5	Page layout
Styling	CSS3	UI design
Client Logic	JavaScript (ES6+)	Data handling & UI updates
Browser APIs	MediaDevices, Screen Capture, Speech Synthesis, Notifications	Input capture & alerts

7. Features & Capabilities

Feature	Capability
Text Emotion Analysis	Detects sentiment & harmful language
Speech Emotion Recognition	Voice-based stress analysis
Facial Expression Detection	Visual emotion inference
Screen OCR Monitoring	Detects negative content exposure
AI Chatbot	Supportive interaction
Risk Alerts	High-risk behavior detection
Wellness Score	Quantitative mental state indicator

8. Performance Optimizations

- Modular model execution to reduce latency
- Lightweight preprocessing pipelines
- On-demand model loading
- Optimized feature extraction
- Threshold-based alert triggering
- Reduced redundant inference cycles

9. Security & Privacy

Aspect	Implementation
Data Storage	Minimal & session-based
Encryption	Secure local processing
No Cloud Dependency	Offline inference support
User Consent	Explicit runtime permissions
Medical Safety	Non-diagnostic design
Ethical AI	Bias-aware model usage

⚠ This system does **not store personal data permanently** and is **not intended for medical diagnosis**.

10. Project Group Photo



10. Team Member name

- ***Sayan Paul***
- ***Soudipta Manna***
- ***Abar Khan***
- ***Soumyadip Maji***
- ***Soumyajit Maiti***

