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Glenunga International High School

2025 Oliphant Science Awards
Programming, Apps & Robotics
Glenunga International High School Year 7-8

MoodMate Report

An Offline AI Voice Assistant to Prevent Road Rage

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Video Link: https://youtu.be/ksYS1a1gzmQ

Term 2

MoodMate

Acrobat Reader

VLC media player

Vivi

Hotspot Shield

Google Chrome

MoodMate

Hello, your MoodMate is here~

Recording for 3 seconds...

EXIT APP

Search

9:49 AM
26/07/2025

PROBOOK

HP Support
Technical Support
Care Pack Service
HP(I) Register / Sign in

Table of Contents

1. Introduction

MoodMate is an offline voice assistant I created especially for drivers. It helps them stay calm while driving and lowers the risk caused by road rage. The program uses the Whisper base.en model to detect 11 common anger-related trigger words, such as “Damn,” “Stupid,” and “Hurry up.” These words were chosen based on psychology research, studies on driving behavior, and real-life driving situations. The system runs directly on the device and is designed to be accurate and reliable.

Unlike many voice assistants that rely on cloud servers, MoodMate runs completely offline. All voice data is only stored in the device’s memory for a short time and is deleted right after it's analyzed. The whole process takes less than 1.2 seconds, which helps protect the driver’s privacy and emotional safety.

The system uses a layered audio response method. Depending on how angry the driver sounds, it plays a calming voice prompt, then a joke, and finally soft music to help them feel better. This step-by-step approach is based on scientific research and helps promote safer driving.

MoodMate can greatly lower the risk of accidents caused by strong emotions while driving. I hope it can help make the roads safer for more families like mine.

2. Project Inspiration

I decided to create MoodMate because of a road rage incident that my mum and I experienced—and I will never forget it.

One day, we were driving home at a normal speed when a man in the car behind us became very angry. He thought we were going too slow. When we stopped at a red

light, he got out of his car, walked up to ours, smashed the right side mirror, and hit our window hard with his hand.

Luckily, my mum reacted quickly. She locked all the doors and held me close. We weren't hurt, but the fear and shock I felt in that moment stayed with me.

This experience helped me realize that emotions while driving can be very dangerous. It doesn't just affect the driver—it can also harm their family and even innocent people.

That's when I had the idea: what if there was a voice assistant that could help calm drivers down when they get angry? I wanted to make something that could reduce the chance of danger. I hope MoodMate can help not just my family, but thousands of other families like ours.

3. The Dangers of Road Rage

Road rage is not just about shouting angrily. It can include dangerous driving, tailgating on purpose, cutting off other cars, damaging vehicles, and even turning into physical violence. These strong emotions can put the angry driver at risk, but they also endanger passengers, other drivers on the road, and even innocent families.

In Australia, the number of road rage incidents is worrying. According to a 2024 report, 48.36% of male drivers and 46.75% of female drivers have been involved in a road rage situation. In South Australia, the number is even higher—58.6% of drivers said they have experienced road rage themselves.

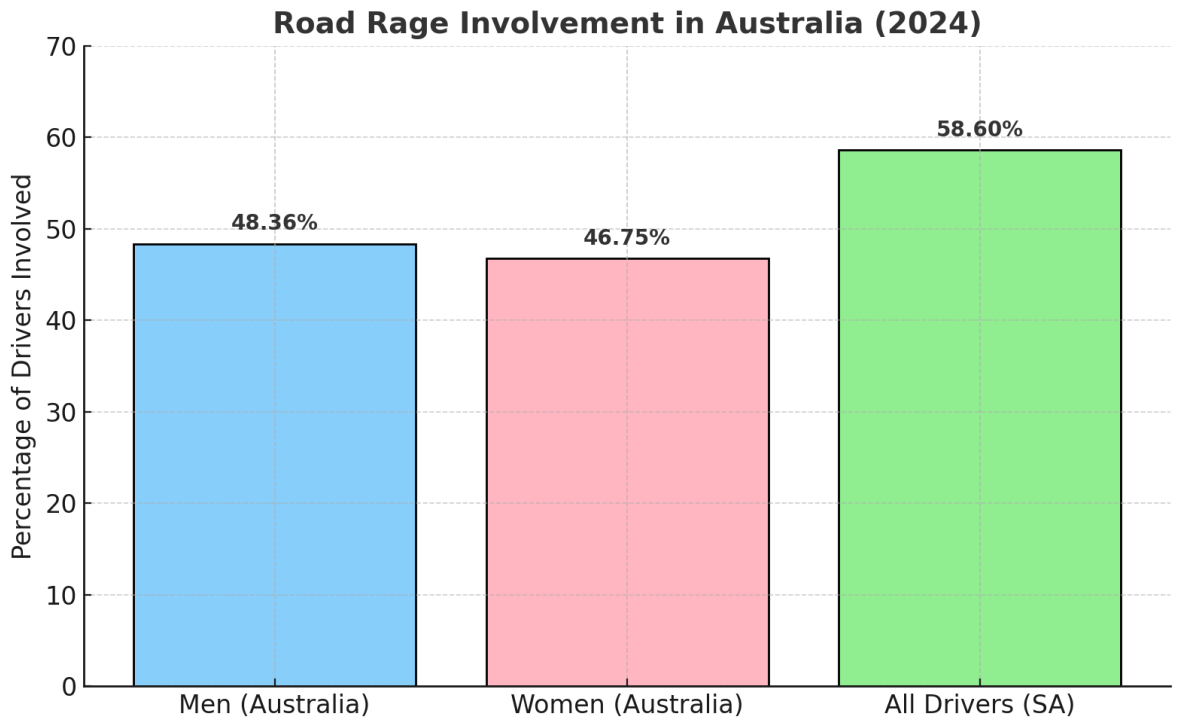


Figure 1. This picture is a chart showing how often road rage happened in Australia in 2024

Many of these incidents involve things like yelling, rude gestures, aggressive overtaking, or tailgating. But some cases become much more serious and even violent.

- In 2023, during peak traffic in Adelaide, a female driver was attacked by an angry man who smashed her window with a side mirror.
- On a highway in northern Adelaide, a dashcam recorded a physical fight between drivers that forced nearby cars to swerve suddenly. It was extremely dangerous.

Even more worrying is that children are often innocent victims of road rage. A 2023 study found that 21% of road rage incidents in New South Wales and the Australian Capital Territory happened while children were in the car.

Road rage is not just an emotional problem—it's a public safety issue. It can lead to crashes, injuries, and even lasting trauma for families.

That is one of the reasons why I developed MoodMate. I want to help drivers stay calm before anger turns into dangerous actions, so they and their families can stay safe on the road.

4. MoodMate Program Design and How It Works

MoodMate is an offline voice assistant designed for driving situations. It can detect strong emotions and respond in a calming way. The program uses a modular structure, meaning it is built from different parts that work together. All voice data is collected, processed, and handled locally on the device to keep user privacy safe. The whole program runs automatically in the background. It uses speech recognition, keyword detection, and a layered response system to give real-time emotional support.

4.1 Technical Structure and Key Modules

MoodMate is made up of five main modules that work together to create a stable and effective voice-based emotion feedback system:

1. Voice Collection Module
The program automatically records the driver's voice every 3 seconds using the sounddevice library, with a sample rate of 16,000Hz. The recording process is non-blocking, which means it runs smoothly in the background without slowing down the system.

2. Speech Transcription Module
The program uses the faster-whisper tool to run the Whisper base.en model. It turns the recorded audio into text directly on the device, without using the internet. This protects privacy and makes sure data is processed securely and quickly.

3. Anger Keyword Detection Module
The text is turned into lowercase letters, and the program checks it for any anger-related keywords (like "hurry up," "damn it," or "what the hell") using a local keyword library. If one is found, the anger counter (anger_count) increases by one.

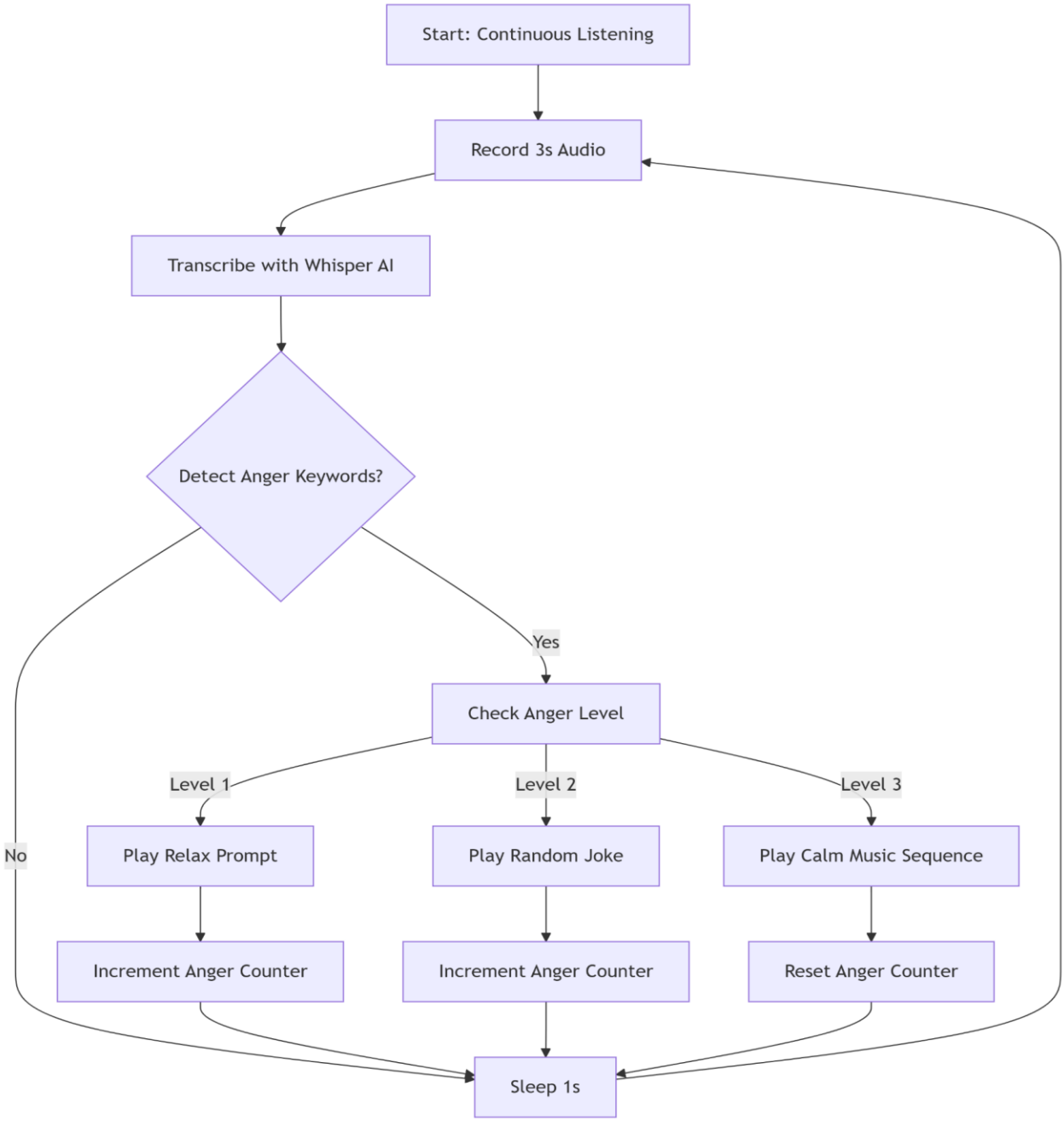
4. Emotion Response Module (Three-Tier Intervention)

- First trigger: Plays a gentle voice message like “Are you okay?”, based on CBT (Cognitive Behavioral Therapy) to help the driver become aware of their feelings.
- Second trigger: Randomly plays a joke (joke1–6.mp3) to shift the driver’s mood through humor.
- Third trigger: Plays a soft tone and calming music (calm1–6.mp3), which works like music therapy to lower heart rate and cortisol levels. This also resets the anger counter.

5. Loop Control and Counter Management Module

The main program runs a non-blocking while True loop. It checks every 3 seconds, and after each response, it waits 1 second before checking again. All audio is played using the Pygame library, which does not interrupt the main loop.

This picture is MoodMate Technical Architecture Diagram ：



4.2 How to Use MoodMate and User Experience

MoodMate is designed so that the driver doesn't need to do anything while using it. The program runs quietly in the background and supports the driver's emotions without needing any manual control. This way, drivers can feel comforted and supported at all times.

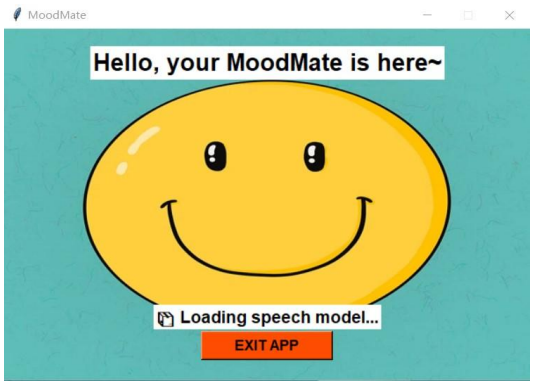
Here is the full user process:

1. **Starting the Program**

   After the user double-clicks the MoodMate icon, the program automatically loads the model and begins listening.

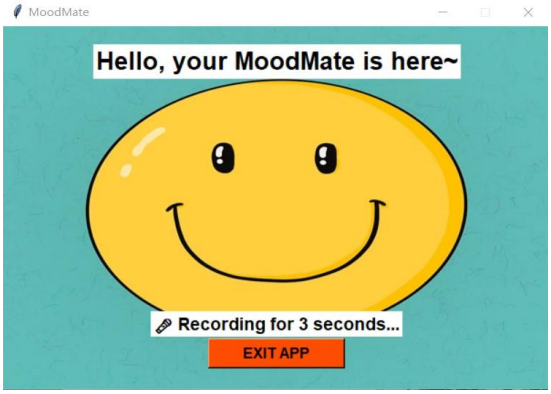
   The screen shows the message:

   "**Hey there, your MoodMate is here~**"
   This means the program is ready to help.



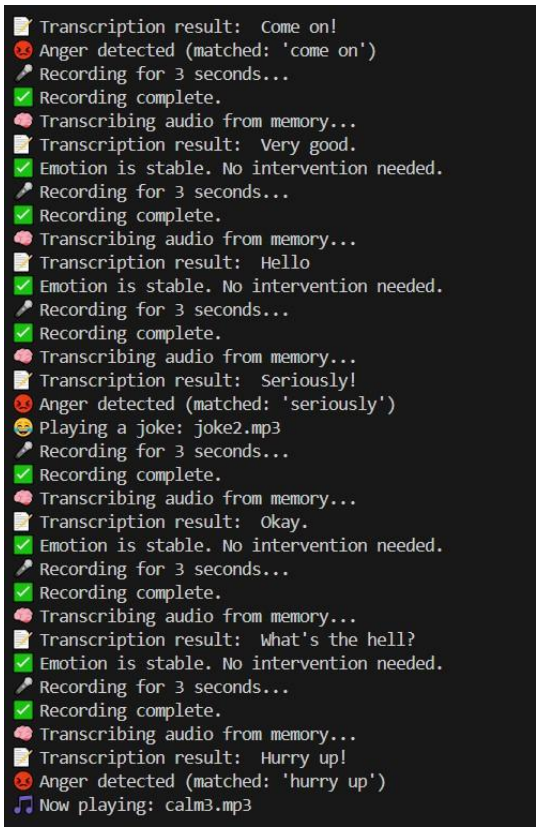
2. **Background Listening and Real-Time Response**

The program listens to the driver's voice every 3 seconds. It checks for emotional keywords and evaluates the driver's emotional state. If angry words appear more than once in a row, MoodMate responds gently but quickly to help calm the driver down.



3. **Auto Reset and Ongoing Support**

After each response, the system automatically resets the anger counter and starts a new listening cycle. This prevents the same message from playing again and again, so the driver won't feel annoyed or resistant to the support.



4. **Privacy Protection System**

MoodMate uses in-memory audio processing only. It does not save voice recordings to disk, upload them to the cloud, or store any personal data. All

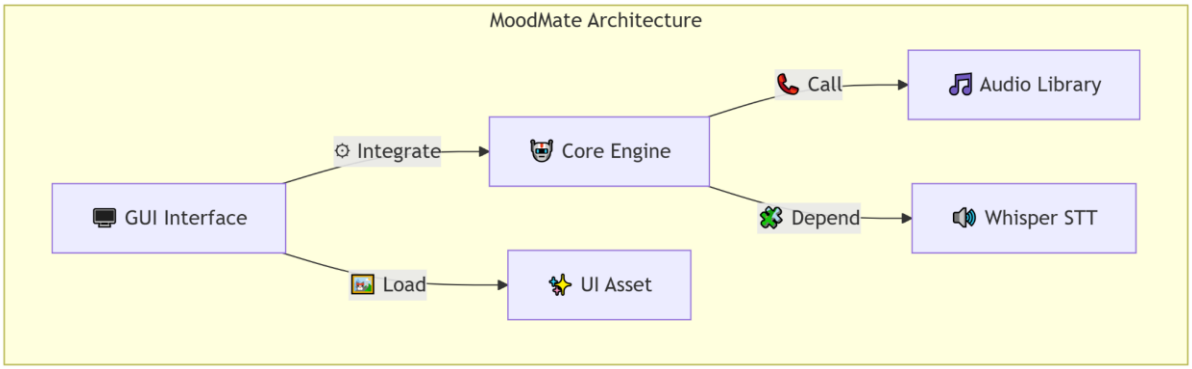
emotional analysis is done offline using local AI models to ensure privacy and security.

```
# Record 3 seconds of audio from microphone
fs, audio_np = record_audio()

# Create an in-memory audio buffer (NOT saved to disk)
buffer = io.BytesIO()
write(buffer, fs, audio_np)
buffer.seek(0)

# Transcribe using local Whisper model (NO internet or upload)
segments, info = model.transcribe(buffer)
```

This demonstrates that:

- io.BytesIO() stores audio in memory, not on the hard drive.
- There are no lines like open("file.wav", "wb"), which would save to disk.
- No use of requests, urllib, or any other libraries that send data online.
- Whisper runs entirely offline, using local models (no cloud AI).

User Experience Flowchart:



5. Scientific Basis for the Three-Tier Emotional Response

MoodMate's three-level response system is based on research in psychology and neuroscience. It follows a step-by-step path of emotional regulation:
Verbal Comfort → Emotional Redirection → Physical Relaxation.
Each level has scientific support, explained below:

Level 1: Voice Prompt (CBT – Cognitive Behavioral Intervention)
Studies have shown that when people feel seen or understood, their brain naturally becomes less tense.

Supportive voice messages can help people calm down and become more aware of their emotions.
Sources: Mayo Clinic; CBT Practical Guide

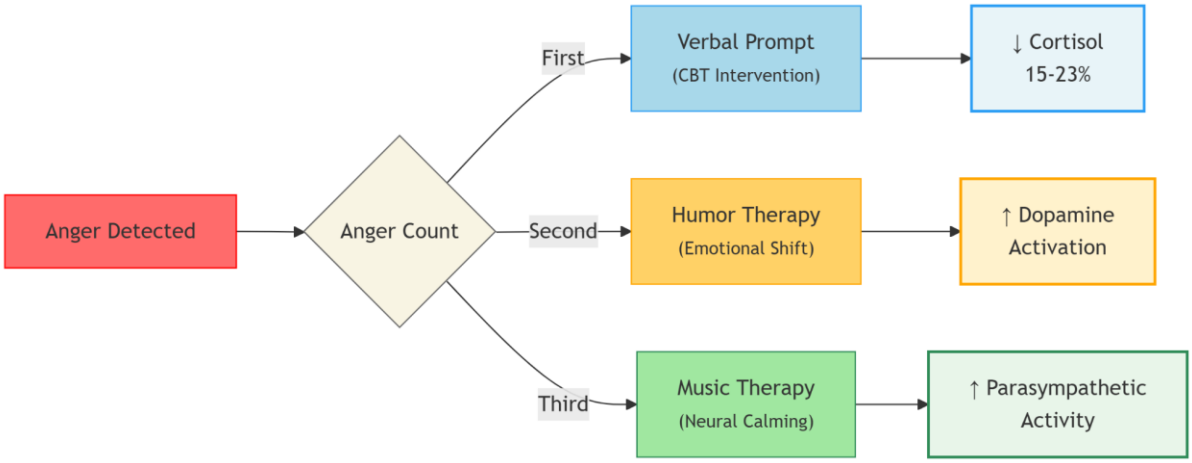
Level 2: Humorous Audio (Emotional Redirection)
Humor activates the brain's reward system, releases endorphins, and reduces cortisol (the stress hormone).

Listening to jokes helps shift attention and breaks the cycle of growing anger.
Sources: HelpGuide; APA Research Summary

Level 3: Calming Music (Music Therapy)
Music therapy is often used in mental health care. It helps slow heart rate, lower blood pressure, and reduce anxiety.

Quiet music activates the parasympathetic nervous system, helping the body return to a calm state.
Sources: Harvard Health; Frontiers in Psychology.

Flowchart - The Three-Tier Intervention Logic:



6. Scalability and Real-World Application

MoodMate is built using a modular design. Each function—like keyword detection, voice playback, and interface display—can be updated, replaced, or expanded separately. This structure makes it easy to run on different devices and allows for future upgrades and new uses in other situations.

6.1 Design Flexibility

MoodMate has strong potential for future expansion. Here are some ways it could be improved or extended:

- **Emotion Detection Upgrades**
  In addition to detecting anger, future versions could recognize emotions like anxiety or sadness, offering more complete emotional support.
- **Multi-Language Support**
  By switching the Whisper model language pack, MoodMate could recognize emotions in different languages, making it usable worldwide.

- **Custom User Settings**

  Users could choose their favorite voice prompts, joke styles, and background music to make the experience more personal.
- **Emotion Log and Reports**

  MoodMate could track emotional patterns and create a visual “Emotional Driving Chart” to help users better understand their mood habits.
- **Deployment on Mobile or Embedded Devices**

  The program can run on low-power devices like a Raspberry Pi, making it possible to install MoodMate in real vehicles as an embedded system.

6.2 Versatile Use Cases

MoodMate isn’t just for private car drivers. It could also be useful in many real-world situations:

Scenario	Application Description
In-Car Emotion Safety System	Installed in vehicles to detect anger and provide multi-level interventions in real time.
Home Stress Relief Device	Used in daily life as a voice-based emotion reminder to improve home emotional environment.
Psychological Education Tool	Demonstrates emotional regulation principles and AI emotion recognition in school psychology classes.
Human-Computer Interaction Research	Used as a prototype for emotion-based voice interaction in university research or design labs.

Elderly/Special Needs Calming Assistant	Provides local voice support and soothing feedback for emotionally sensitive individuals.

MoodMate is not just a demonstration project — it is a growing emotional AI system with real product potential. I hope that in the near future, it can be used in real cars or everyday life to bring more safety and calm to people everywhere.

7. Conclusion

Through this project, I learned how technology can be used to solve real-life problems in a meaningful way. MoodMate was inspired by a frightening moment in my own life, and turning that experience into something helpful made this project very personal to me.
By combining voice recognition, emotion detection, and science-based calming methods, MoodMate shows how AI can support mental health and road safety at the same time. I discovered how powerful it is to use code not just for making apps, but for making a difference.

I believe MoodMate has the potential to keep growing, and I hope one day it can be used in real cars to help more drivers stay calm and safe. This project has made me more confident in my skills and more excited to explore how science and technology can improve people’s lives.

8. Appendix: Full Source Code – MoodMate main.py (with comments)

This section includes the full source code of MoodMate, written in Python. The code is fully commented to explain how each part works. It demonstrates how the program detects anger through voice input and responds using voice prompts, jokes, and calming music.

```
# ========================================================
# MoodMate - Emotion-Aware Voice Assistant for Drivers
# Author: Daniel Rao
# Purpose: Detect anger in a driver's voice and respond
# with calming voice prompts, jokes, or music.
# ========================================================

# ============================
# 1. Import Required Libraries
# ============================

import os                                   # File and directory handling
import pygame                               # To play audio files
import sounddevice as sd                    # To record sound from
microphone
import random                               # To randomly choose
jokes/music
import numpy as np                          # For numerical array handling
import io                                   # For in-memory audio
processing
import time                                 # For delays between
recordings
from scipy.io.wavfile import write          # To write WAV files to memory
from faster_whisper import WhisperModel     # Whisper model for speech
recognition

# ================================
# 2. Set Base Directory for Resources
# ================================

BASE_DIR = os.path.dirname(os.path.abspath(__file__))
```

```
# ========================================
# 3. Initialize Pygame for Audio Playback
# ========================================

pygame.mixer.init()

# ==================================
# 4. Audio Playback Helper Function
# ==================================

def play_audio(file_path):
    """
    Plays a given audio file using pygame.
    """
    pygame.mixer.music.load(file_path)
    pygame.mixer.music.play()
    while pygame.mixer.music.get_busy():
        pygame.time.Clock().tick(10)

# ============================================
# 5. Play a Sequence of Calming Music Tracks
# ============================================

def play_calm_music_sequence():
    calm_files = [f"calm{i}.mp3" for i in range(1, 7)]
    random.shuffle(calm_files)
    for filename in calm_files:
        file_path = os.path.join(BASE_DIR, "music", filename)
        if os.path.exists(file_path):
            print(f"🎵 Now playing: {filename}")
            play_audio(file_path)
        else:
            print(f"⚠️ File not found: {filename}")

# ================================
# 6. Play a Random Joke to Lighten Mood
# ================================

def play_joke_prompt():
    joke_files = [f"joke{i}.mp3" for i in range(1, 7)]
    random.shuffle(joke_files)
    for filename in joke_files:
        file_path = os.path.join(BASE_DIR, "music", filename)
```

```
        if os.path.exists(file_path):
            print(f"😂 Playing a joke: {filename}")
            play_audio(file_path)
            return
    print("⚠️ No jokeX.mp3 files found.")

# ==================================
# 7. Define Angry Keywords to Detect
# ==================================

anger_keywords = [
    "seriously", "hurry up", "come on", "get out of the way", "what the
hell",
    "what a mess", "get a move on", "damn it", "what are you waiting
for",
    "piece of crap", "i can't believe it"
]

# ================================================
# 8. Respond When Anger Is Detected in User Speech
# ================================================

def detect_anger_and_respond(text, anger_count):
    text_lower = text.lower()
    matched_keywords = [kw for kw in anger_keywords if kw in
text_lower]

    if matched_keywords:
        print(f"😡 Anger detected (matched: '{matched_keywords[0]}')")

        # First warning → friendly prompt
        if anger_count == 0:
            relax_path = os.path.join(BASE_DIR, "music",
"relax_prompt.mp3")
            if os.path.exists(relax_path):
                play_audio(relax_path)
            else:
                print("❌ relax_prompt.mp3 not found.")
            return 1

        # Second warning → play a joke
        elif anger_count == 1:
```

```
            play_joke_prompt()
            return 2

        # Third warning → play calm music
        elif anger_count == 2:
            music_prompt = os.path.join(BASE_DIR, "music",
"music_prompt.mp3")
            if os.path.exists(music_prompt):
                play_audio(music_prompt)
            else:
                print("❌ music_prompt.mp3 not found.")
            play_calm_music_sequence()
            return 0  # Reset anger count

    else:
        print("☑ Emotion is stable. No intervention needed.")
        return anger_count

# ==============================
# 9. Record Audio from Microphone
# ==============================

def record_audio(duration=3, fs=16000):
    """
    Records audio for 3 seconds.
    """
    print(f"🎤 Recording for {duration} seconds...")
    recording = sd.rec(int(duration * fs), samplerate=fs, channels=1,
dtype='int16')
    sd.wait()
    print("☑ Recording complete.")
    return fs, recording

# ==================================
# 10. Transcribe Audio with Whisper AI
# ==================================

def transcribe_audio_memory(model, fs, audio_np):
    """
    Transcribes recorded audio from memory using Whisper.
    """
    print("🧠 Transcribing audio from memory...")
```

```
    buffer = io.BytesIO()
    write(buffer, fs, audio_np)
    buffer.seek(0)
    segments, info = model.transcribe(buffer)
    result = " ".join([segment.text for segment in segments])
    print(f"📝 Transcription result: {result}")
    return result

# ================================
# 11. Main Loop - MoodMate is Listening
# ================================

if __name__ == "__main__":
    anger_count = 0

    print("📦 Loading speech recognition model. Please wait...")
    model = WhisperModel("base", device="cpu", compute_type="int8")
    print("☑️ Model loaded successfully.")
    print("👂 MoodMate is listening... recording every 3 seconds.\n")

    # Continuous loop to keep listening and analyzing emotion
    while True:
        fs, audio_np = record_audio()                                    #
Step 1: Record 3 seconds of voice
        recognized_text = transcribe_audio_memory(model, fs, audio_np)
# Step 2: Transcribe voice to text
        anger_count = detect_anger_and_respond(recognized_text,
anger_count)  # Step 3: React if angry
        time.sleep(1)  # Short pause before next recording
```

9. References

1. Mayo Clinic. (2023). Cognitive Behavioral Therapy (CBT): Techniques and Uses. https://www.mayoclinic.org/tests-procedures/cognitive-behavioral-therapy/about/pac-20384610

   → Used to support the design of MoodMate's first-level intervention, which

uses CBT-inspired voice prompts to increase emotional self-awareness.

2. HelpGuide. (2021). Laughter is the Best Medicine. https://www.helpguide.org/articles/mental-health/laughter-is-the-best-medicine.htm
   → This source explains how humor can reduce stress, supporting the use of joke audio in MoodMate's second-level emotional intervention.

3. Harvard Health Publishing. (2022). How music can help you heal. https://www.health.harvard.edu/mind-and-mood/how-music-can-help-you-heal
   → Used to explain why calming music is effective for emotional recovery, which supports MoodMate's third-level intervention.

4. Frontiers in Psychology. (2020). Music intervention for stress and anxiety reduction in adults: A systematic review. https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2020.00374/full

   → Scientific research showing that music therapy can lower heart rate, anxiety, and cortisol levels, directly supporting the calming audio strategy in MoodMate.

5. American Psychological Association (APA). (2021). The Psychology of Humor and Stress Relief. https://www.apa.org/news/press/releases/stress/2021/humor-stress
   → Explains how humor activates the brain's reward system and reduces cortisol, justifying the second-tier humor response in your app.

6. Government of South Australia (Suggested Source). Road Rage Statistics in South Australia (2024).
https://www.police.sa.gov.au/about-us/traffic-statistics
→ Used for the road rage statistics mentioned in Section 3, showing how common and dangerous this problem is, especially with children in the car.

7. OpenAI – Whisper Model Documentation. (2023). Robust Speech Recognition.
https://github.com/openai/whisper
→ This is the speech recognition model MoodMate is built on, which runs offline to protect user privacy.

8. Faster-Whisper GitHub Project. (2023). Efficient Whisper Model Implementation.
https://github.com/guillaumekln/faster-whisper
→ The faster version of Whisper used in MoodMate for real-time, on-device transcription without internet.