

Voice-Based Emotion Detection Using Deep Learning

Introduction

Human emotions are integral to communication. With the rise of smart assistants and mental health platforms, recognizing emotional states via voice can significantly enhance interaction quality. This project leverages voice recordings to detect emotions using deep learning and real-time analysis.

Abstract

This project focuses on classifying human emotions (like happy, sad, angry, etc.) using audio samples. It uses the RAVDESS dataset for training and supports live microphone recording and audio upload for real-time prediction. By extracting Mel-frequency cepstral coefficients (MFCCs), the model identifies the speaker's emotional state with a CNN. The app is built using Streamlit with support for visualization and animated feedback.

Tools Used

- Language & Frameworks: Python, TensorFlow, Streamlit
- Audio Processing: Librosa, Sounddevice, Soundfile
- UI/UX: Streamlit-Lottie, Plotly, Matplotlib
- Dataset: RAVDESS (Ryerson Audio-Visual Database of Emotional Speech and Song)

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Steps Involved in Building the Project

1. Dataset Preprocessing:

- Loaded and labeled RAVDESS files
- Extracted MFCCs for CNN input

2. Model Building:

- Built a CNN with Conv2D, Pooling, and Dropout layers
- Trained on 8 emotion classes
- Achieved high accuracy on test set

3. Interface Development:

- Built using Streamlit with dark theme
- Real-time microphone input & file upload support
- Lottie animations to visualize emotion
- Trend graph using session logs

4. Deployment & Testing:

- Tested locally with Streamlit
- Configured launch via launch.json in VS Code
- Ready for deployment on Streamlit Cloud or Vercel

Conclusion

The project successfully demonstrates voice-based emotion recognition with a user-friendly interface. It can be extended for mental health diagnostics, virtual assistants, or customer service feedback systems. Future improvements could include multi-language emotion detection, confidence calibration, and edge deployment via mobile apps.