Title:

Audio-Based Emotion Classification Using Google Teachable Machine

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Date: 2025

Abstract

This project investigates the ability of a basic, no-code machine learning system to identify the emotional tone of brief speech samples. I used 24 labeled speech samples that were recorded using a microphone to train a three-class audio classifier (Happy, Angry, and Neutral) using Google Teachable Machine. The generalization of the model was then assessed using fresh spoken phrases. Strong prediction confidence (80–87%) was found for each target emotion in the results, proving that even those without coding experience can use easily accessible machine learning tools to complete simple affective computing tasks.

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1. Introduction

Affective computing, human–computer interaction (HCI), and cognitive science all heavily rely on speech emotion recognition. A lot of systems use machine learning to categorize emotions based on acoustic characteristics like tone, pitch, and intensity.

The project's objective was to use no-code machine learning to create an approachable proof-of-concept model that can identify emotional tone. The project exhibits knowledge of audio labeling, ML training, dataset creation, and model prediction evaluation.

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2. Methods

2.1 Tools Used

- Google Teachable Machine (Standard Audio Project)

- Built-in microphone for data collection
- TensorFlow Lite export for saved model

2.2 Emotion Classes

Three emotion categories were used:

- **Happy**
- **Angry**
- **Neutral**

2.3 Dataset Collection

A total of **24 audio samples** were collected:

- 8 Happy
- 8 Angry
- 8 Neutral

Each sample was 1–3 seconds long.
I recorded short phrases expressing each emotion, altering pitch and tone to match the intended label.

2.4 Training Configuration

- **50 epochs**
- Default learning rate
- Real-time spectrogram preprocessing
- Teachable Machine audio classification architecture

2.5 Model Export

The trained model was exported as a TensorFlow Lite (TFLite) file. The file is also included in the GitHub repository for future use.

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3. Results

The trained model was tested on multiple new phrases spoken in different emotional tones.

3.1 Neutral Test Example

Phrase: *“How was class today?”*
Prediction: **Neutral – 87%**

3.2 Happy Test Example

Phrase: *"Today is going to be a great day today!"*
Prediction: **Happy – 80%**

3.3 Angry Test Example

Phrase: *"What did you do?"* (angry tone)
Prediction: **Angry – 81%**

3.4 Observations

- The model correctly classified all test phrases.
- The model predicted high scores but never 100% (>80%).
- The model appeared sensitive to changes in tone and vocal energy.
- Background noise was detected as a separate entity.

Screenshots of predictions are included in the screenshots/ folder.

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4. Discussion

4.1 Model Performance

Despite a small dataset, the model performed well. This shows that speech emotions exhibit strong acoustic patterns that can be captured even by simple ML models.

4.2 Limitations

- Only 24 samples → limited amount of audio training
- Similar phrases may cause overfitting
- Background noise sensitivity
- Emotions like "sadness" or "excitement" were not included
- Model was only tested on one speaker (me)

4.3 Future Improvements

To enhance accuracy and generalization:

- Increase dataset to 20–30 samples per emotion
- Add more emotion classes (Sad, Excited, Calm)
- Record in quieter environment
- Use different speakers to diversify data

- Export and analyze spectrograms in Python for deeper ML practice

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5. Conclusion

This project shows that, with just no-code tools, machine learning can identify the emotional tone of speech. Despite its simplicity, the system demonstrated the potential for emotion recognition systems at the beginner level and operated with reliability. This project lays a solid basis for further ML research in affective computing and cognitive science.

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6. Appendix

- Training configuration screenshot
- Audio sample spectrogram images
- Prediction confidence charts
- Link to GitHub repository