

A colorful spectrogram with a dark background, showing frequency components over time. The colors range from blue (low intensity) to yellow and red (high intensity), with vertical streaks of energy.

DepressionDetect

Detecting depression from acoustic features of speech using a convolutional neural network

...

Ky Kiefer

Data Scientist | Energy Engineer

kkiefer@umich.edu

Motivation

- 50% do not seek treatment for major depression.

DepressionDetect

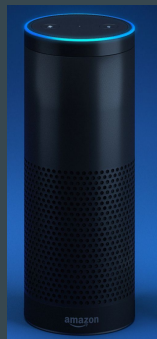
Discontent

Awareness

Apathy

Solution

- Wearable or home devices providing and early and objective detection.



Can you detect depression from speech?

Not semantics, acoustics!



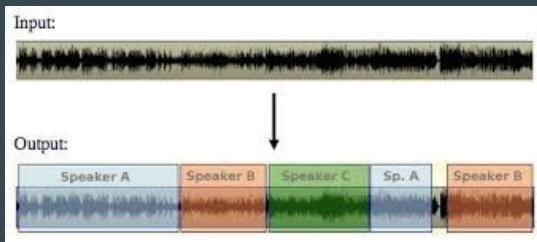
Data

- 50 hours of virtual interviews from USC.
- 189 participants.
- Depression classification (0/1) from psychiatric survey.



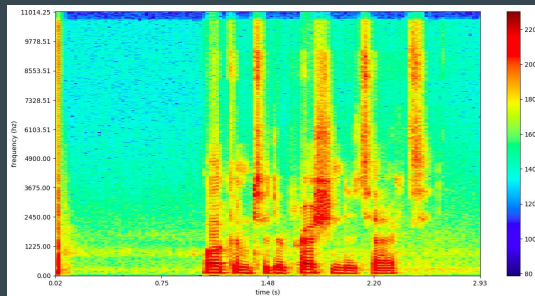
Workflow

1 | Speaker Diarization



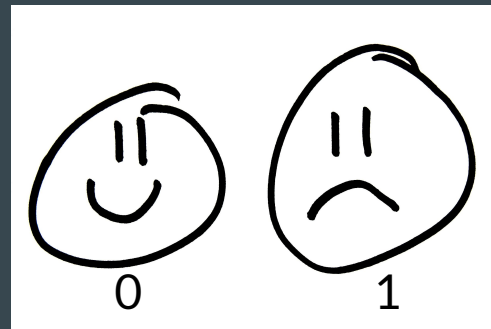
Support Vector
Machine

2 | Feature Extraction



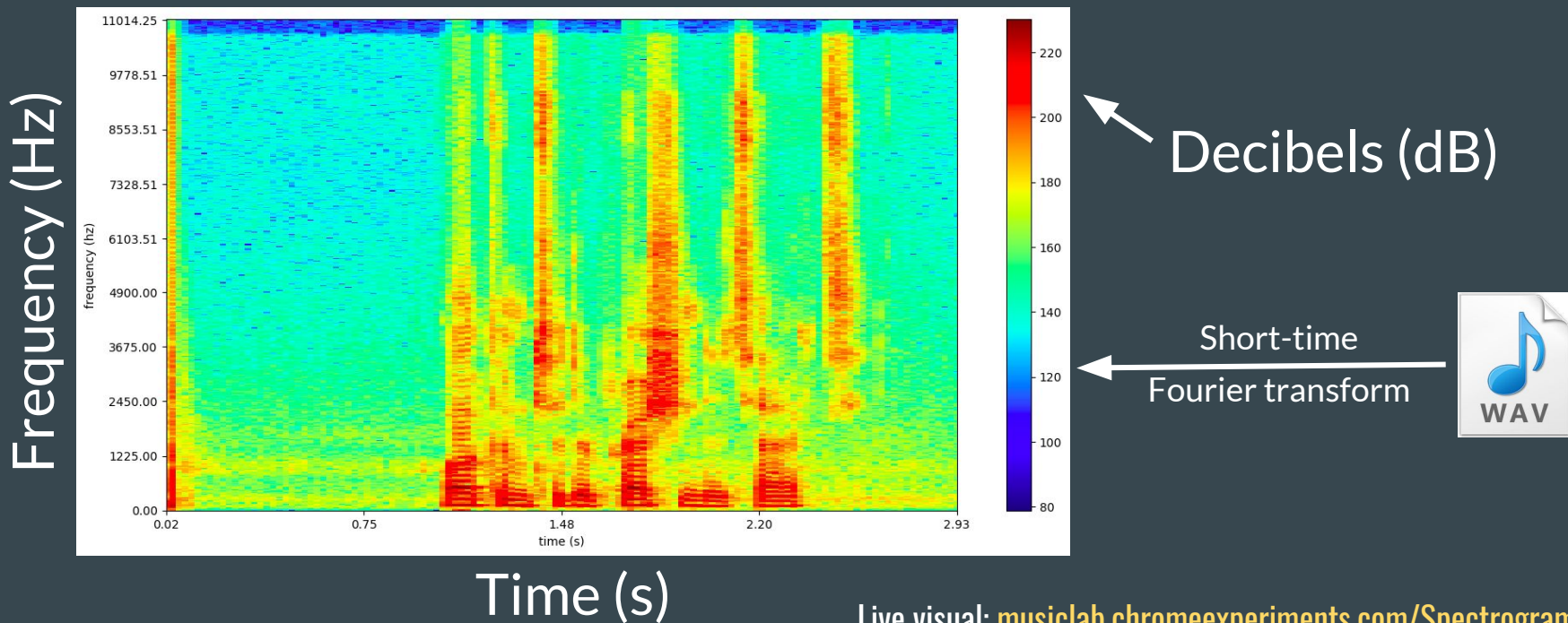
Spectrogram

3 | Classification



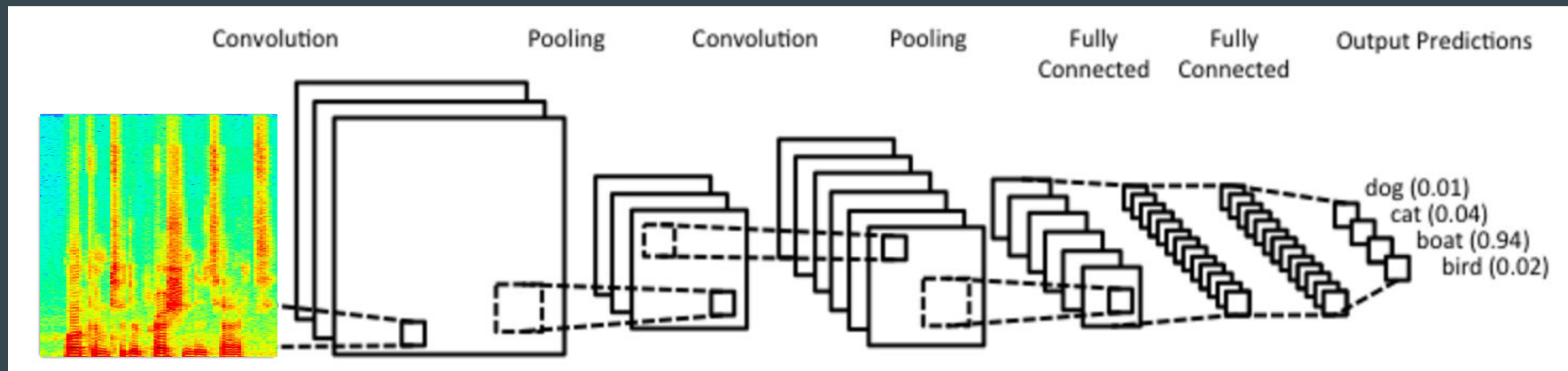
Convolutional
Neural Network

Seeing sound. Spectrograms.



Live visual: musiclab.chromeexperiments.com/Spectrogram

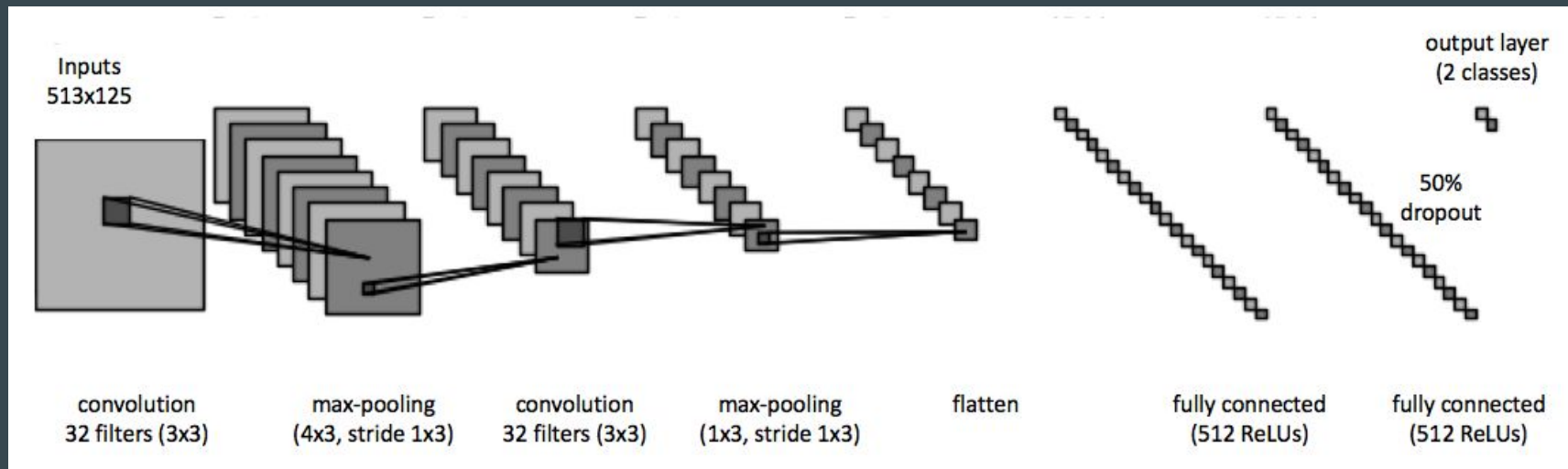
Convolutional Neural Networks



Resources

- Video: <https://www.youtube.com/watch?v=FmpDIaiMleA>
- Stanford's CS231n: <http://cs231n.github.io/convolutional-networks/>

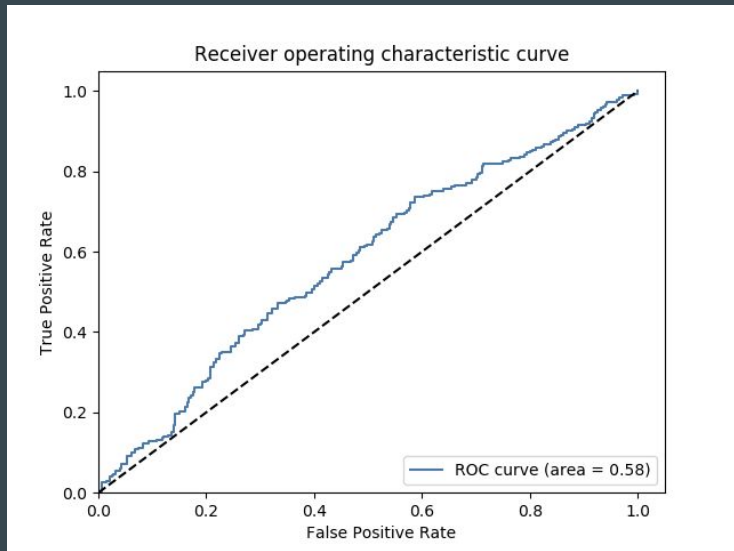
DepressionDetect Architecture



- 513 frequency bins (0 to 8kHz)
- 125 time bins (totaling 4s of audio)

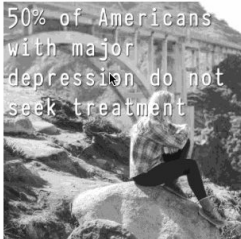
Results

- 55% accuracy predicting on 4-seconds of audio.
- 64% accuracy when taking majority vote across 40 4-second clips (2m 40s).



Become a data donor!

- Speech data is inherently noisy.
- Robust models rely on 1,000s hours of data.




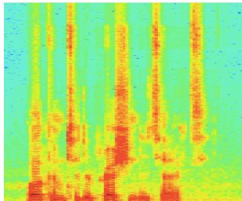
50% of Americans with major depression do not seek treatment

Interested in the science? See for yourself.

DepressionDetect is an open-source project rooted in Python. The project seeks to objectively identify early signs of depression from acoustic features of speech. Early detection and treatment of depression is essential in promoting remission, preventing relapse, and reducing the emotional burden of the disease. To date, the model has learned from over 70 people, but it needs your help! Learn more about the project below, donate your data, or contribute some code.

***DepressionDetect* seeks to reveal mental illness. Before it becomes damaging.**

Your audio recordings are anonymized upon donation and will never be sold or distributed. The audio files you donate are deleted immediately after being processed into a numerical representation of sound for the machine learning algorithm. If you have specific questions on how your data is used contact me at kkiefer@umich.edu.



DataStopsDepression.com

Questions?

Visit DataStopsDepression.com to become a data donor!



Ky Kiefer



kkiefer@umich.edu



linkedin.com/in/kykiefer

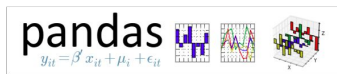


github.com/kykiefer

Tech Stack



IP[y]: IPython
Interactive Computing



theano

