focus | attention | confusion | effort

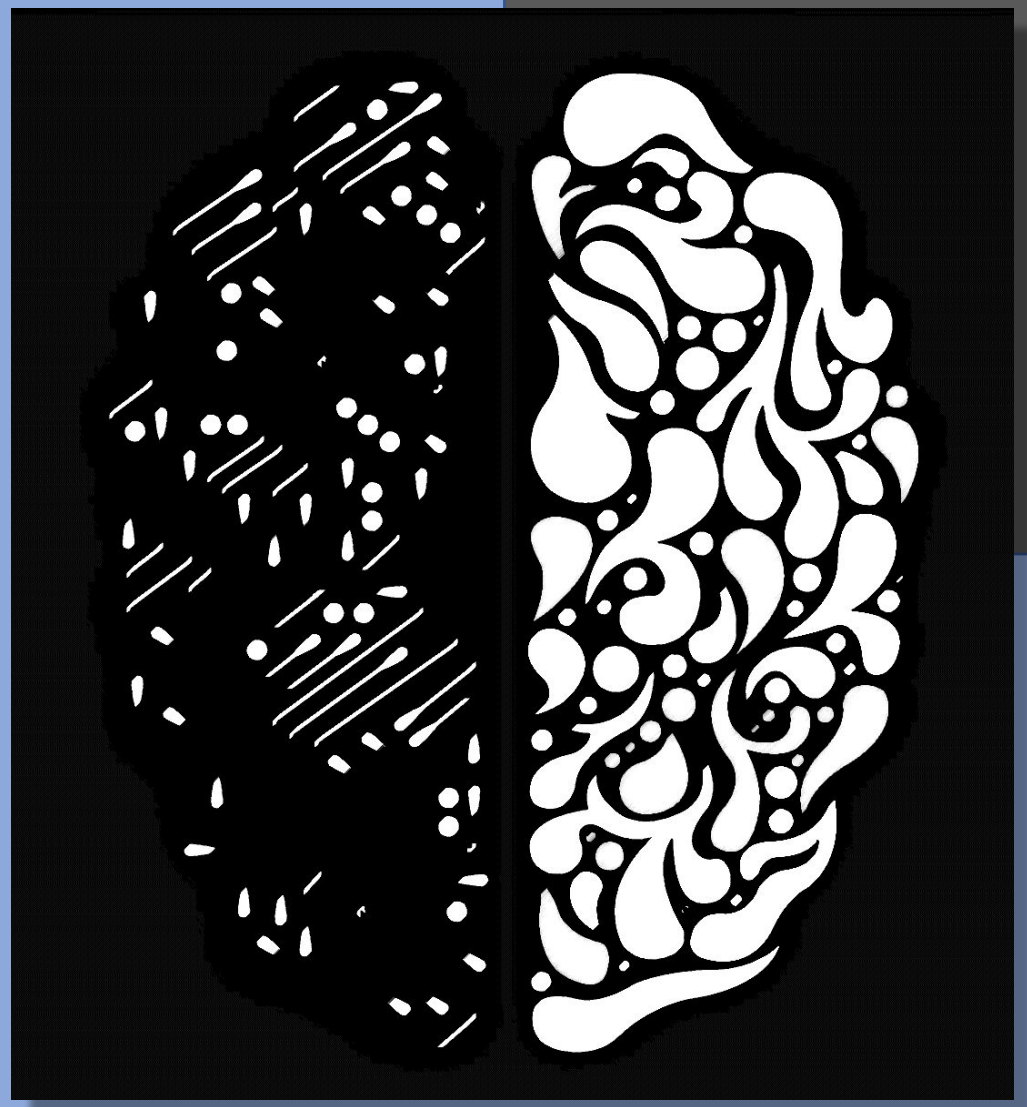
How learning happens

3 Step Process

Data Collection.

Data Processing.

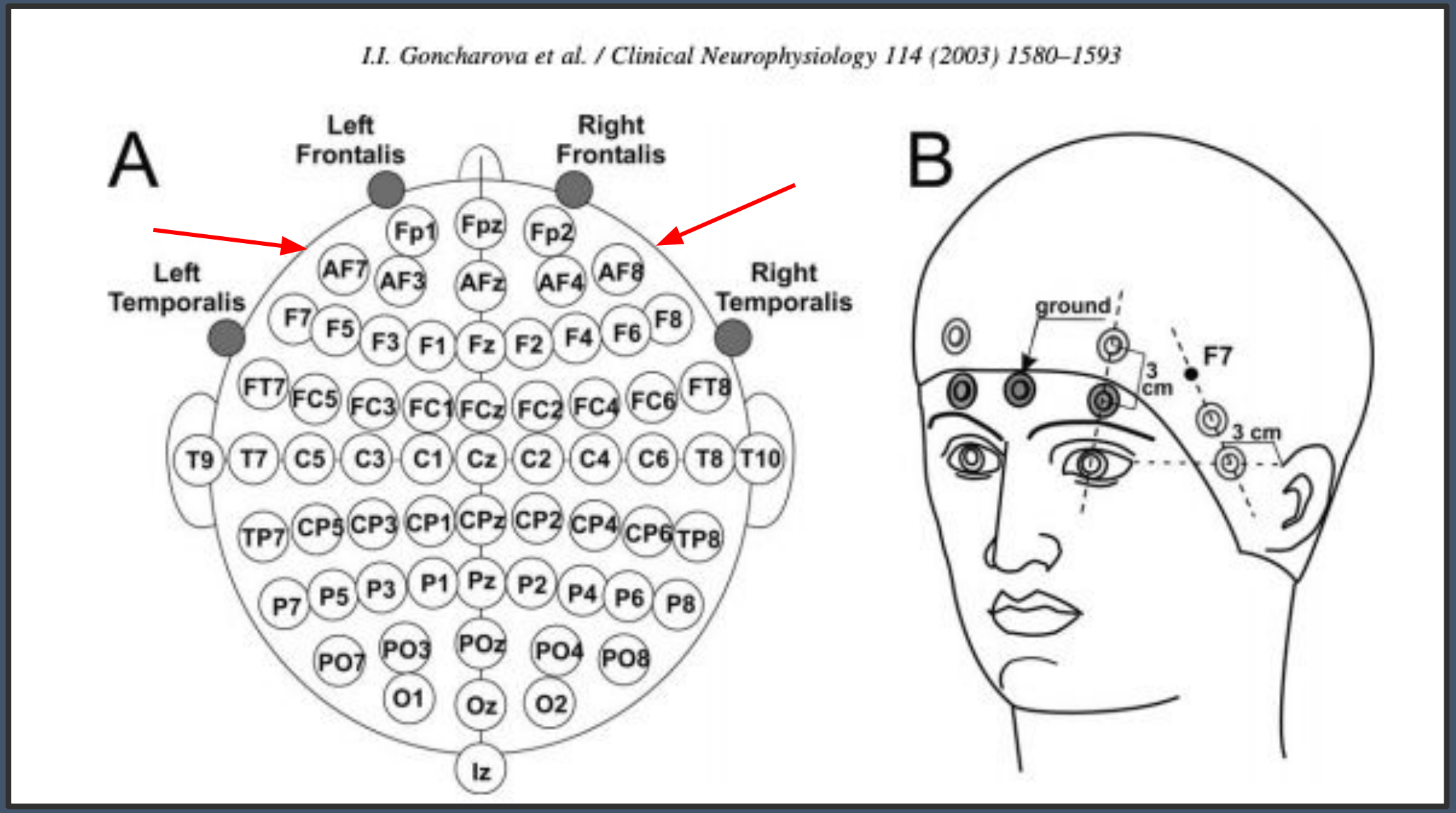
Machine Learning.



Types of Data Collected.

- EEG
- Pupil Dilation
- Audio

Traditional EEG



EEG Recording

- Muse Heaband
- Muse Monitor to run Fourier Transformations and send .csv to drop box

Pupil Recording

- Pupil Labs Headset
- Converted pupil size to percent change
- Converted time stamp to Datetime
- Merged with EEG on Datetime

Audio Recording

- Built a Python Audio Recorder using:
  - Pyaudio
  - Scipy.wave
  - Scipy.fft
  - time
  - os
  - csv

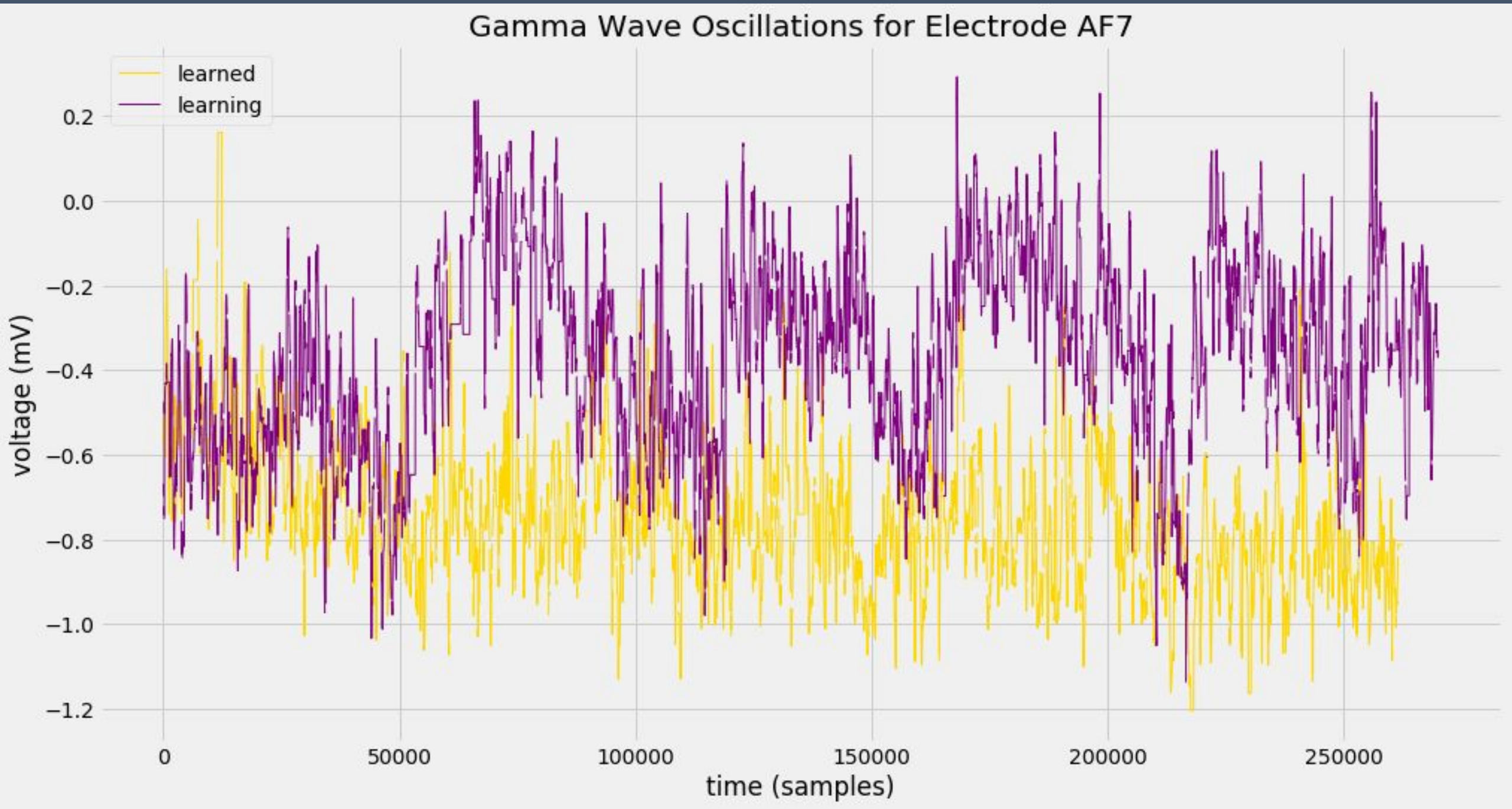
The Process

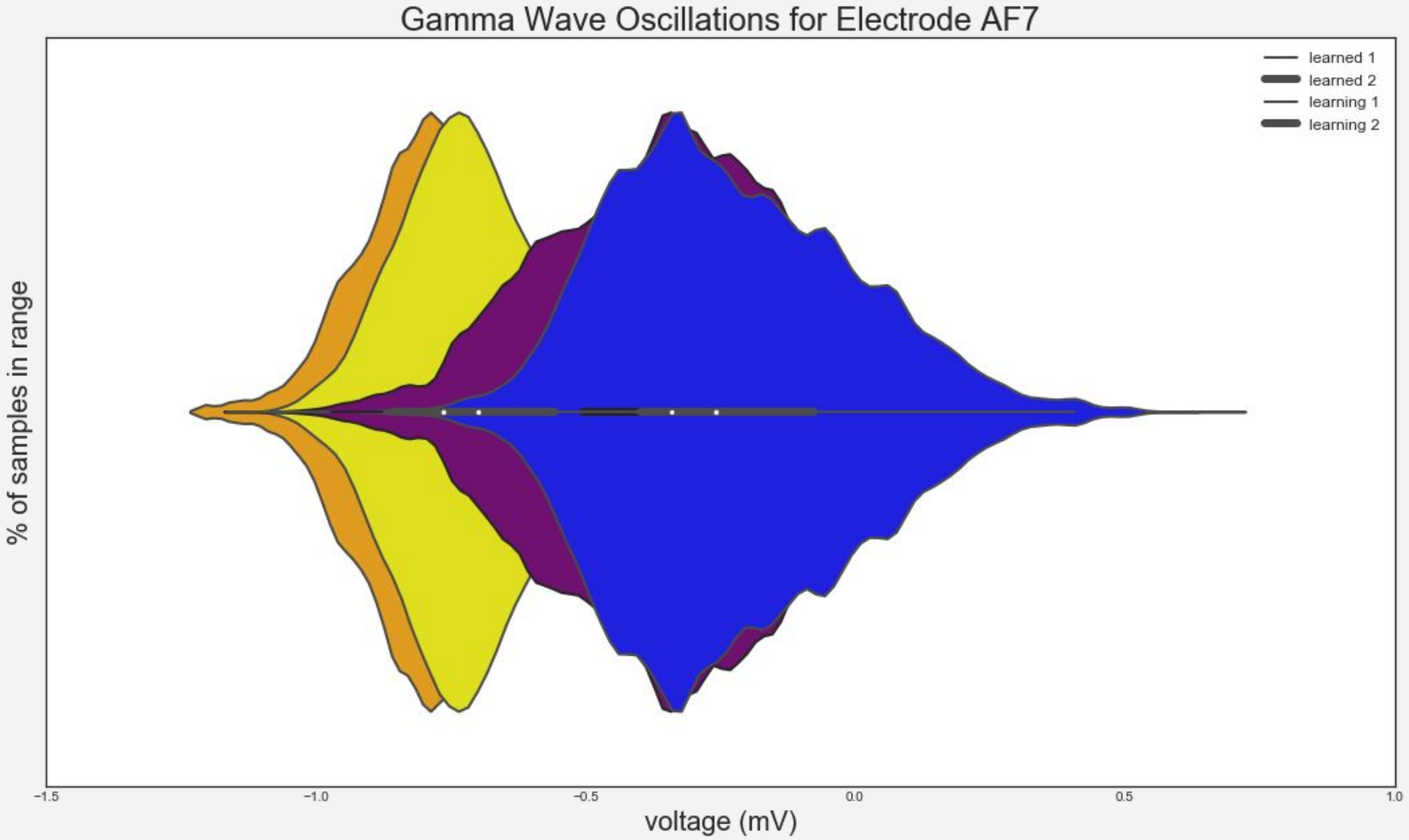
1) Record EEG of piano performances, equally split with **“Learned”**, and **“Learning”** labels.
2) Sync streams of data and begin recording
3) Repeat at regular intervals (twice daily)
4) Process, integrate and analyze data.
5) Test model on new data

Preliminary Results

Highest Coefficients

Linear Regression	Random Forest
Gamma AF7 (4.56)	Gamma AF7 (.25)
Gamma AF8 (3.03)	Gamma AF8 (.13)
Delta AF7 (2.63)	Beta AF7 (.04)
Delta AF8 (2.08)	Alpha AF8 (.03)


Gamma Wave Oscillations for Electrode AF7
learned
learning
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−1.2
voltage (mV)
0
50000
100000
150000
200000
250000
time (samples)


Gamma Wave Oscillations for Electrode AF7
learned 1
learned 2
learning 1
learning 2
% of samples in range
−1.5
−1.0
−0.5
0.0
0.5
1.0
voltage (mV)

Test Results.

Song	Prediction Mean	Prediction Prob Mean
Arabesque #1	96.4	78.0
Hedwig's Theme	98.6	79.3
Nocturne in Eb	76.4	66.4
Mazurkas	67.8	62.4

Next Steps.

To Do:

More training,

Incorporate Pupil Data,

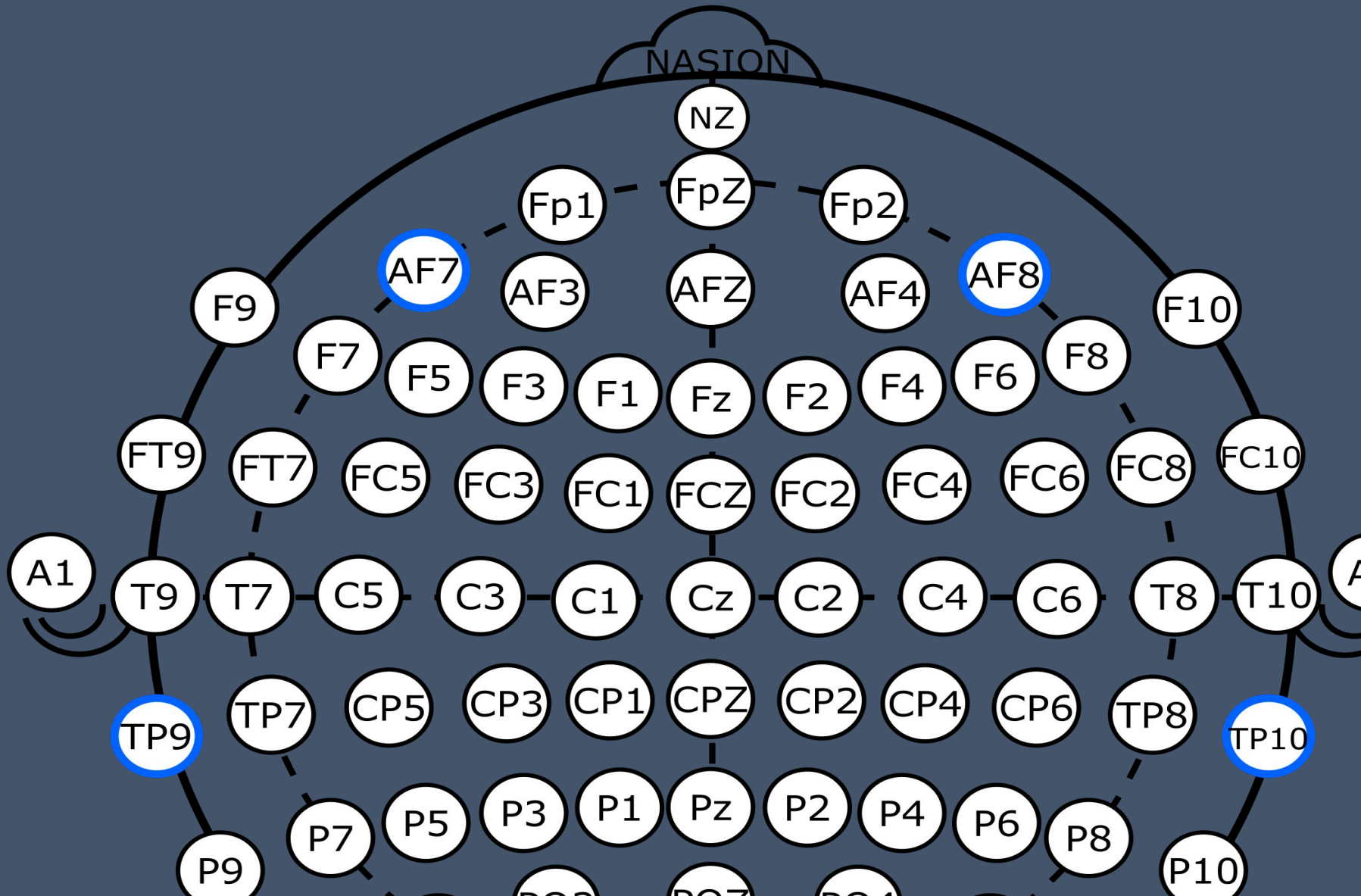
Add Time Lag Features,

Add Brains,

Process Audio,

Run CNN,

Expand Activities



Join the Study!

https://github.com/DSTrichter

David S. Trichter
theDSTrict.com