

## Biometric Audio Text Analysis App



# University of Texas at Dallas

**MINTS:** Multi-scale Intelligent Interactive Integrated  
Sensing and Simulation

## Meeting 1

Feb 11, 2022

## Mentors:

### Arjun

Office hours: Tu/Th: 3 – 5 PM



### Shawhin

Office hours: M/W 3:30 – 7:00 PM  
by appointment



### Ash

Office hours: M/W 10:00 AM –  
12:00PM



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### Agenda:

- Project Overview/Background
- Data Sources
- Related Works
- Big Picture
  
- Project Logistics
- Entrance Survey
- Expectations
- Goals

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### Project Overview:

- Research relationship between audio text and biometrics
- Create interactive dashboard visualization

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## Background: Autonomic Nervous System

- Requires no conscious effort: Blood pressure, Rate of breathing, etc.
- Sympathetic and Parasympathetic
- Sympathetic – Fight or Flight

	<b>Parasympathetic</b> <i>Body at rest</i>	<b>Sympathetic</b> <i>Emergency situations</i>
<b>Eyes</b>	Constricts pupils	Dialates pupils
<b>Heart</b>	Beat more slowly	Beats faster and stronger
<b>Lungs</b>	Constricts airways	Relaxes airways, which lets you breath more deeply
<b>Digestion</b>	Stimulates digestion	Inhibits digestion
<b>Muscles</b>	Reduces bloodflow to skeletal muscles	Increases bloodflow to skeletal muscles

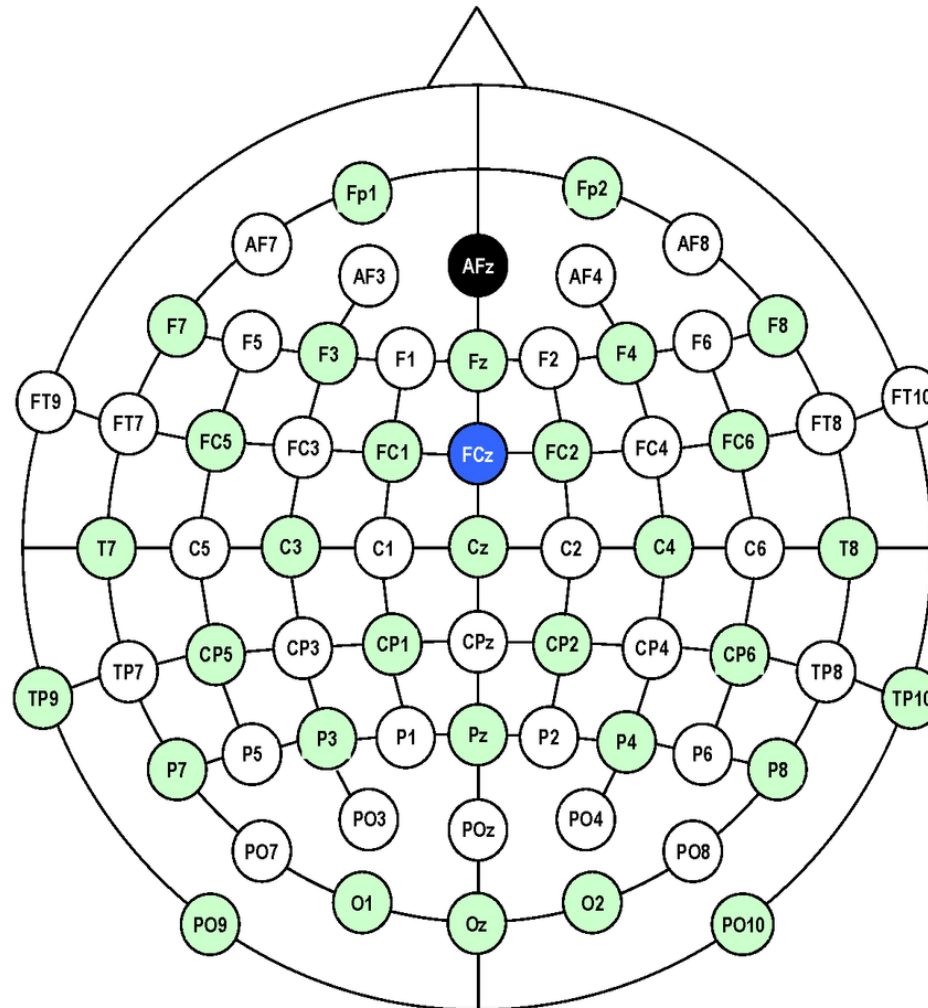
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## Background: EEG Brain Activity

- Calculate power spectra using raw EEG readings (in microvolts) using Fourier transforms
- [https://www.youtube.com/watch?v=mj86XmfOniY&ab\\_channel=ShawhinTalebi](https://www.youtube.com/watch?v=mj86XmfOniY&ab_channel=ShawhinTalebi)
- Frequency bands/electrodes govern particular behavior
- Delta, Theta, Alpha, etc.

Electrode Names





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## Background: Biometric Measurements

- **For more information:**  
<https://github.com/mi3nts/biometricDashboard3>

# Data Sources

tobii



Tobii Pro Glasses 2



GSR



Temp



ECG



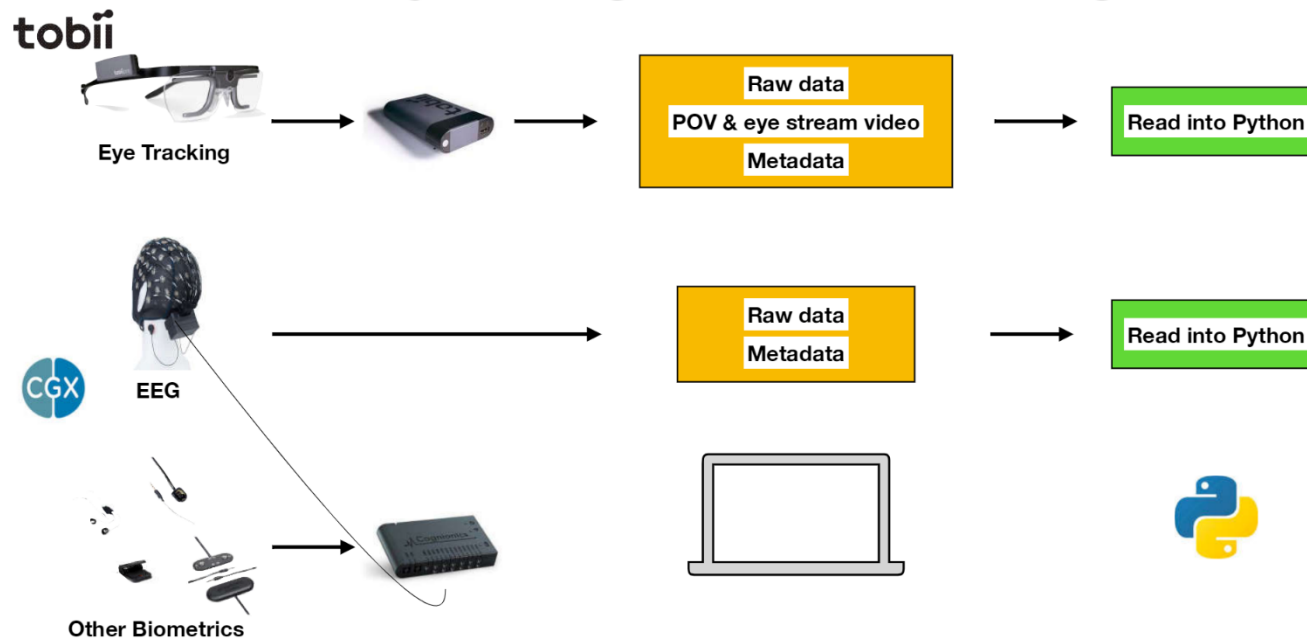
PPG/SpO2/HR



Cognionics Mobile-64



# Early Stage Processing



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### Related Works:

- **Bike Study**
- **Interactive ADELE**

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### Big Picture

- **Why?**
- **Study involuntary reaction to gain actionable insight**
- **How?**
- **Sensors capture brain signals and other biometric measurements**
- **Participant watches Youtube video**





# Text Transcript

---

00:08

Frank

00:11

that's your real name get off

00:15

threatening innocent people in danger

00:17

because you squeal because you had a

00:19

colony we've gone back the hammer that

00:21

was for you or the show what does that

00:25

mean you really have to spell it out for

00:28

you red huh I'm disappointed

00:31

listen carefully okay are you listening

# Pandas DataFrame

```
Fp1    ...  SpO2    HR    GSR    Temp.
-0.007787  ...  100.0  74.0  3652.219534  30.3125
-0.007784  ...  100.0  74.0  3652.219534  30.3125
-0.007784  ...  100.0  74.0  3652.219534  30.3125
-0.007784  ...  100.0  74.0  3652.219534  30.3125
-0.007784  ...  100.0  74.0  3652.219534  30.3125
...    ...  ...    ...    ...    ...
-0.007823  ...  100.0  74.0  3655.751467  30.1875
-0.007823  ...  100.0  74.0  3655.751467  30.1875
-0.007823  ...  100.0  74.0  3655.751467  30.1875
-0.007823  ...  100.0  74.0  3655.751467  30.1875
-0.007828  ...  100.0  74.0  3655.751467  30.1875
```





### Text Toxicity Analysis:

Toxicity: 99.358

Severe Toxicity: 23.118

Obscene: 94.418

Threat: 43.290

Insult: 80.342

Identity Hate: 2.473

the men you kill shit did you think I'm just some crazy  
asshole going unloading whoever I want yeah that's  
exactly what I think you think you 're anything else I  
think the people I kill need killing that 's what I do you  
left two men



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### Project Logistics:

- **Meet weekly Fridays at 10:30 AM**
- **Meetings should last around 1 hour**
- **Meet on MS Teams for now**
- **Communicate via email mainly, MS Teams or text for emergencies**

What are you hoping to gain from this project?

4 responses

ML experience on real-world data and doing collaborative work

Machine Learning experience in a modern setting (how it's actually done in the field rather than in class theory, research projects, and random TensorFlow tutorials).

I'm interested in learning about new applications of CS and software skills, as well as the fulfillment of working on a meaningful project

I want to make a meaningful contribution to a research project. Ideally, I am hoping to impress you all enough to earn a letter of recommendation (for graduate schools and research programs).

What attributes do you value most in a team?

4 responses

Planning, Willingness to share ideas

Catching problems before they happen with good communication; developing a coherent architecture beforehand so people don't step on each others' toes.

I value appreciation of effort and achievement - I like a team that puts a lot into their work and celebrates each other

I like working with people that are friendly and who can work done on time.

What can we do to help you be successful?

4 responses

Having planned deliverables/checkpoints would be very helpful for balancing other coursework + the project.

Not schedule things for Saturday night? I think that's my only non-negotiable timeslot. Since we have meetings only on weekdays, I don't imagine this will be too much of an issue.

Project management is really important and part of what that means to me is defining goals and actionable items for the team. If the roadmap is clear, I find it much easier to be engaged and spend time learning and developing products

I can't think of anything in particular, but I will ask for help if I need it!

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### Expectations:

- 3 - 7 hours per week
- Deliverables every week: Upload to GitHub as PDF
- Use template in repo
- Code documentation (see next slide)

Spyder (Python 3.8)

File Edit Search Source Run Debug Consoles Projects Tools View Help

C:\Arjun\UT\_DALLAS\Graduate\Research\NLP\_Senior\_Design\read\_data.py

hw4.py × get\_frames\_class\_twitter.py × svm\_count.py × example.py × data\_processing.py × read\_data.py ×

```
1  # CODE TO READ EEG FILE COLLECTED WITH THE COGNIONICS MOBILE-128 SYSTEM USING MNE AND
2
3  # CODE AUTHORED BY: ARJUN SRIDHAR
4  # PROJECT: biometricSpeechAnalysis
5  # GitHub: https://github.com/mi3nts/biometricSpeechAnalysis
6  # =====
7
8  # import libraries
9  import mne
10 import pandas as pd
11 import datetime
12 import time
13
14 # INPUTS
15 # - vhdr_fname = string. path to relevant .vhdr file
16 # ~ example: vhdr_fname = "../data/2020_06_04_T05_U00T_EEG01.vhdr"
17
18 # OUTPUTS
19 # - eeg_data = pandas dataframe with columns as biometric variables and rows as
20 #   timesteps
21
22 # DEPENDENCIES
23 # - none
24
25 # DEPENDERS
26 # - none
27 def read_eeg(vhdr_fname):
```

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### Goals:

- **Feb 18/25: Acclimated and comfortable with project and dataset**
- **March 11/25: Rough draft/outline of web dashboard**
- **April 22: Final product, documentation**