

Project:

Members: Rishi Arjun, Abhi Gundrala, Czarinah Micah Rodriguez, Qiqing (Lily) Li, Riya Dabbi, Maya Malaviya, Mandy Elashoff, Woojin Ko, Nidhir Guggilla, Kathan Shah

Frontend: Mandy, Lily

Backend: Abhi, Nidhir

Data Analytics: Maya, Riya, Rishi, Kathan

Overall Helper: Woojin, Micah

Relevant Links (drive folder, github, docs, etc.):

- Main Google Drive Folder
 - https://drive.google.com/drive/u/0/folders/16cyQRSG81rLoqcolfQs_ep9cskaxUcYXQ
- Focus Pocus Short Guide
 - https://docs.google.com/document/d/15pClmQeGEQGouQPmCfq_rFDBLHpuiMISWGpFj43OxPFQ/edit
- Github
 - <https://github.com/micahrodriguez/FocusPocus>
- Data Analytics
 - [Data Analysis Colab](#)
 - [Preprocessing Module](#)
 - [N170 Visual Guide](#)
- Team Availability
 - <https://www.when2meet.com/?9994366-vq8vy>
- Relevant Articles
 - [Driver Drowsiness Detection Using EEG Features](#)
 - http://centaur.reading.ac.uk/67219/1/draft_3-0.pdf (affective state manipulation using music)
 - <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5671572/> (Overview of research in the field)
 - [Husain G., Thompson W. F., Schellenberg E. G. \(2002\)](#) (The introduction of the arousal-mood hypothesis)
 - <https://www.frontiersin.org/articles/10.3389/fpsyg.2018.00254/full> (Computing arousal and valence values from power bands)

Front-End

- Complete the file upload feature.
- Improve the UI of the login and registration pages.
 - Additionally, make them accessible from the main website. At the moment, one needs to manually type in the URLs in order to access them.
- Refactor file/class/function names so that they make more sense.
- Implement a live-recording feature.
- Implement other features (graphs, etc)

Back-End

- Complete the file upload feature.
- Create a data analysis algorithm to analyze uploaded sessions.
- Find a way to store and access data on a per-user basis.

Timeline

Week 1 (10/10-10/16):





- **Frontend + Backend:**
 - went through sessions scripts and worked on the file upload function
- **Data Analytics:**
 - Found new research articles with relevant datasets
 - Reviewed Colab notebook and created documentation for it
 - Discussed various directions of project including using our 9 datasets, getting datasets from articles, using new headsets to collect new data, etc

Week 2 (10/17-10/23):

- **Frontend + Backend:**
 - Backend (**Abhi**):
 - Develop csv scheme in db and research connecting flask pipeline to frontend file upload
 - Frontend (**Lily, Mandy, Sherry**):
 - Sessions tab: Completed changing "Choose file..." to the uploaded file name in "Custom File Upload" section in "Session" page, upon successful file upload, with the help from Clay(?)

- **Equipment/Logistics:**
 - Have **Micah** and **Maya** pick up Muses for team
 - **Micah** reach out to **Sherry** for frontend help
- **Data Analytics:**
 - Research (**Rishi, Riya, Abhi**)
 - Finding more relevant articles with procedures and datasets we can use, continue working on Colab
 - Look into technical specifications of new muse headset and find concentration-music related eeg datasets
 - **Rishi** reach out to Abhi P. to ask about sleepiness + driving
 - **Riya** linking github repo for that project in the slack

Week 3 (10/24-10/30):

- **Frontend + Backend:**
 - Sessions tab
 - For adding a new session 
 - (done:)) Add text boxes for session name and description.
 - (still working on this) Figure out how to add tags, and date+time stamps
 - Make an upload button to add it to the session table
 - Sessions table
 - Each row displays the name of the session.
 - Clicking the row should maximize  and show the session's details (tags, description, etc).
 - Have the ability to edit session  details and remove  a session
 - When done:
 - Try uploading a csv file and fill in details
 - Reminder that we have the Muse csv data in the Google drive folder
 - The file should appear in the table along with its information
- **Data Analytics:**
 - ~~Start fine tuning and adjusting current algorithm (creating testing, training, and validation sets)~~

- Change gears from ML pipeline to simpler signal processing of beta waves. Read up on how to analyze; use NMEP materials as guide.

Week 4 (10/31-11/7):

- **Frontend + Backend:**

- Sessions tab: connect frontend and backend stuff
 - For adding a new session ⊕
 - Figure out how to add tags, and date+time stamps

- **Data Analytics:**

- Implement FFT (Fast Fourier Transform) in our analysis notebook.
- Read up on PSD with the help of Micah's NMEP notebooks.
 - Note: NMEP eeg notebook(s) won't be out until next week but I'll have the lecture vids up soon this week.

Week 5 (11/7-11/14):

-Updates:

- **Supplements:**

https://docs.google.com/spreadsheets/d/1-S998del9QcbAfy_QDaNe4k7Era7lYfbFh2o1G-nZlA/edit#gid=0

- **Frontend + Backend:**




- Research

- **Data Analytics:**

- Implemented PSD on current dataset (divided into distracted & undistracted), outputting 2 main periodograms consisting of 4 electrodes each

-Plans:

- Meet up Sunday after 12pm for a hackathon session
- **Supplements:** gather articles to use, take notes, begin first draft of an introductory supplement
- **Frontend + Backend:**
 - Sessions tab: connect frontend and backend stuff
 - For adding a new session ⊕
 - Figure out how to add tags, and date+time stamps
 - Sessions table
 - Each row displays the name of the session.

- Clicking the row should maximize  and show the session's details (tags, description, etc).
 - Have the ability to edit session  details and remove  a session
- When done:
 - Try uploading a csv file and fill in details
 - Reminder that we have the Muse csv data in the Google drive folder
 - The file should appear in the table along with its information
- **Data Analytics:**
 - Implement average band power calculations (using Simpson's Rule most likely) on both individual node graphs and overall to find both relative and absolute power of each frequency band
 - (Maya and maybe Rishi) Collect data on Muse in order to test the Data Analytics.
 - Add labels to any graphs made, so that it's easier to communicate what each graph is saying about our EEG data.
 - Micah's additional suggestions:
 - Use morlet convolution (continuous wavelet transformation) to get time, frequency, and power information in one graph
 - Using *morlet* and *cwt* functions (MNE or scipy)
 - Figure out the information provided by the resulting cwt matrix
 - For each time step of the data, see how we could obtain the frequencies with the highest power from the cwt matrix so we can get information about the brain wave patterns over time. And then from this, we can probably get some information of the productivity changes over time.
 - Next week, I'll make a separate Google Colab notebook to make an extensible and documented version where I'll outline the functions and parameters that we would need for the webapp, and then much later, we'll polish, document, and organize our code from the experimental version to the new version.

- For now, focus on the current data analysis NB.

Week 6 (11/15-11/22)

Updates

- **Frontend + Backend**
- **Data Analytics**
 - Implemented new PSD procedure using individual channels and found relative frequencies for each channel's bands

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### Future Goals For Semester:

- **Frontend + Backend**
  - Full webapp customized to our needs
  - Have sections for the modules we want
    - Sessions
      - File/data upload
        - Muse CSV
      - Table with rows of data with name and description
        - Tags (Music, No Music, etc.)
        - Time of data
- **Data Analytics**
  -
- **Overall**
  - Brainstorm
    - Experiments
      - Music vs no music
      - Different types of music (heavy metal vs chill rnb)
      - Environment: Library vs Noisy
      - Study with or without people
      - How tired/sleepy you feel
    - Goals:
      - Self-awareness for focus/stress
      - Live recording -> real-time data -> process data while they're studying, they can get some information about their focus (distracted for too long, take a break alert)

- Can easily do post analysis, but live data processing would be much more impressive
  - Analysis tab:
    - Time vs productivity
- Tracking focus/distraction over the course of a day
  - Can help prioritize different tasks at different parts of the day
  - Pulse analysis can help!
  - See how focus changes over time