Weekly Work Report 9/20/2024

**This Week: Simple classifier based on processed EEG signals**

* **Label**

Label = 0: Baseline, 1: Body Movement, 2: Aha Moment, 3: Confirmation Menu

A bar of numbers with green and orange squares

Description automatically generated with medium confidence

0. Baseline

1. Rotating/ physically moving does not resolve the problem

From TagHandMenuPumpTime - 10 seconds to TagHandMenuPumpTime - 7 seconds

2. Aha Moments/ physically moving when solving a problem

From TagHandMenuPumpTime - 4 seconds to TagHandMenuPumpTime - 1 seconds

3. Confirm Menu

From TagHandMenuPumpTime to TagHandMenuPumpTime + 3 seconds

* **Input**

233 rows × 65 columns

65 columns = 16 channels \* 4 (**max, min, mean, and std)** + 1(label)

*['****Label'****, 'FP1\_mean', 'FP1\_max', 'FP1\_min', 'FP1\_std', 'FP2\_mean', 'FP2\_max', 'FP2\_min', 'FP2\_std', 'C3\_mean', 'C3\_max', 'C3\_min', 'C3\_std', 'C4\_mean', 'C4\_max', 'C4\_min', 'C4\_std', 'P8\_mean', 'P8\_max',*

*'P8\_min', 'P8\_std', 'O1\_mean', 'O1\_max', 'O1\_min', 'O1\_std', 'O2\_mean','O2\_max', 'O2\_min', 'O2\_std', 'F7\_mean', 'F7\_max', 'F7\_min', 'F7\_std', 'F8\_mean', 'F8\_max', 'F8\_min', 'F8\_std', 'F3\_mean', 'F3\_max', 'F3\_min', 'F3\_std', 'F4\_mean', 'F4\_max', 'F4\_min', 'F4\_std', 'T7\_mean', 'T7\_max', 'T7\_min', 'T7\_std', 'T8\_mean', 'T8\_max', 'T8\_min', 'T8\_std', 'P3\_mean', 'P3\_max', 'P3\_min', 'P3\_std', 'P7\_mean', 'P7\_max', 'P7\_min', 'P7\_std', 'P4\_mean', 'P4\_max', 'P4\_min', 'P4\_std']*

A graph of blue rectangular bars

Description automatically generated with medium confidence

* **Feature Importance**
  + **Features: 64**
    - **Channels: all**
    - **RF Accuracy:** 0.47
    - **KNN Accuracy:** 0.47

*['****Label'****, 'FP1\_mean', 'FP1\_max', 'FP1\_min', 'FP1\_std', 'FP2\_mean', 'FP2\_max', 'FP2\_min', 'FP2\_std', 'C3\_mean', 'C3\_max', 'C3\_min', 'C3\_std', 'C4\_mean', 'C4\_max', 'C4\_min', 'C4\_std', 'P8\_mean', 'P8\_max',*

*'P8\_min', 'P8\_std', 'O1\_mean', 'O1\_max', 'O1\_min', 'O1\_std', 'O2\_mean','O2\_max', 'O2\_min', 'O2\_std', 'F7\_mean', 'F7\_max', 'F7\_min', 'F7\_std', 'F8\_mean', 'F8\_max', 'F8\_min', 'F8\_std', 'F3\_mean', 'F3\_max', 'F3\_min', 'F3\_std', 'F4\_mean', 'F4\_max', 'F4\_min', 'F4\_std', 'T7\_mean', 'T7\_max', 'T7\_min', 'T7\_std', 'T8\_mean', 'T8\_max', 'T8\_min', 'T8\_std', 'P3\_mean', 'P3\_max', 'P3\_min', 'P3\_std', 'P7\_mean', 'P7\_max', 'P7\_min', 'P7\_std', 'P4\_mean', 'P4\_max', 'P4\_min', 'P4\_std'] 🡪* ***processing data?***

A graph of a number of blue and white lines

Description automatically generated

A graph of blue columns with white text

Description automatically generated

* + **Features: 14**
    - **Channels: FP1, P3, P4, P7, P8, O1, O2**
    - **RF Accuracy:** 0.47 🡪 0.53
    - **KNN Accuracy: 0.47 🡪** 0.49

*[****'Label'****, 'FP1\_min', 'FP1\_std', 'P8\_max', 'O1\_max', 'O1\_min', 'O1\_std', 'O2\_min', 'P3\_max', 'P3\_min', 'P3\_std', 'P7\_max', 'P7\_min', 'P7\_std', 'P4\_max']*

A graph of a number of blue and white bars

Description automatically generated

* + **Features: 11**
    - **Channels: FP1, ~~P3,~~ P4, P7, P8, O1, O2**
    - **RF Accuracy:** 0.47 🡪 0.53**🡪** 0.49
    - **KNN Accuracy: 0.47 🡪** 0.49 **🡪 0.51**

*[****'Label'****, 'FP1\_min', 'FP1\_std', 'P8\_max', 'O1\_max', 'O1\_min', 'O1\_std', 'O2\_min', 'P7\_max', 'P7\_min', 'P7\_std', 'P4\_max']*

A graph of blue bars

Description automatically generated

A graph of a number of blue and white bars

Description automatically generated

A diagram of a person's face

Description automatically generatedA diagram of a network

Description automatically generated

Posterior temporal lobe

A diagram of the brain

Description automatically generated

The posterior temporal lobe is involved in several **critical cognitive functions**, particularly those related to language, auditory processing, and visual perception.

* **Models**
  + **Random Forest**
  + **KNN**
* **Result: RF**
* **Others**
* Gai
  + Provided an explanation of the Cognitive Load classification code.
  + Consolidated all code into one for Aha! Moment prediction.
* Noviya
  + Met yesterday to share my progress and offer suggestions on how to begin EEG signal processing.
* Wiam
  + Received a response; she plans to connect with me next week.

**Next Week:**

* Conduct a **literature review** on labeling, focusing on attention.
* Continue **processing** **EEG** data for the remaining subjects (other 20 subjects) in the dataset. 43 subjects, 20 subjects
* Knowledge transfer with Wiam allowed me to learn from her expertise.
* **For each task, plot RF feature importance, and then use different features.**
* **Remove features per task.**
* **Frequency band 🡪 features, classifier?**
* **Be careful assume**
* **Keep use initial features for different tasks, don’t preremove any features**