**Section 1: Determine Project Directions (8/12/2021 - 9/6/2021)**

* **Investigated the current state of art for Electronatophy (EEG) /biometrics**
* **Investigated the current state of art for mild traumatic brain injury (mTBI)**

**Conclusion: Go for the EEG/biometrics way.**

**8/12/2021:**

Thinking about working on an EEG system project. Two possible ideas: mTBI detection system or EEG/biometrics

**8/15/2021:**

Found a paper on mTBI detection: *A Raspberry Pi-Based Traumatic Brain Injury Detection System for Single-Channel Electroencephalogram*. Key points: The first system capable of performing mTBI related EEG signal classification, deployed on a portable, low-cost device like RPi and designed to operate in a live configuration. Used two models: CNN and XGBoost

**8/17/2021:**

Found 3 papers that belonged to EEG/biometrics: *EEG Biometrics for Individual Recognition in Resting State with Closed Eyes*, *Electroencephalogram subject identification: A review*, *Challenges and Future Perspectives on Electroencephalogram-Based Biometrics in Person Recognition*

**8/22/2021:**

Read the paper *EEG Biometrics for Individual Recognition in Resting State with Closed Eyes*

Key points: The spatial configurations that are the best for Resting State with Closed Eyes – parieto occipital area, because it's responsible for vision. Used EEG signals for user recognition because of robustness to spoofing attacks and universality.

**8/26/2021:**

Read the paper, *Electroencephalogram subject identification: A review*

Key points: There are subject specific traits of EEG that we can identify – power and peak frequency of the alpha band, beta band. These traits are located in the occipital, temporal, and parietal areas of the brain, if using the RC condition. These traits will change across time and other paradigms, such as the intake of coffee.

**8/29/2021:**

Read the paper, *Challenges and Future Perspectives on Electroencephalogram-Based Biometrics in Person Recognition*

Key points: There are 8 challenges facing in building an EEG/biometric system: Operations, Stability of System Performance, Robustness to the Psychological and Physiological Change, Equipment, User Database, Protocol Design, Performance Evaluation, and Uniqueness of EEG Traits among Twins and Relatives

**9/3/2021:**

Researched EEG-based biometric systems. Found the paper, *BED: A New Data Set for EEG-Based Biometrics*, which was published recently to introduce a new EEG biometric dataset. Read it. Asked the authors for access to their dataset.

**9/6/2021:**

Finished reading the paper, *BED: A New Data Set for EEG-Based Biometrics*.

Key points

* Why biometrics?: Traditional access control approaches require individuals to remember or possess some information or item that must be presented to the access system. Two main problems with traditional access control approaches: information can be forged or stolen, and information can be hard to remember. Biometrics is an alternative to other access methods. (Arnau-González, Katsigiannis, Arevalillo-Herráez, Ramzan, 2021).
* Why EEG-based biometrics?: EEG signals have advantages when compared to other biometrics modalities -- resilient to physical injuries, hard to reproduce, and cannot be captured at a distance (Chan, Kuo, Cheng, and Chen, 2018).
* Why consumer-grade devices?: Consumer-grade devices are low-cost and simplify development in real-life scenarios. Medical-grade devices are expensive and require tedious preparation for acquiring signals.
* DataSet Design: Uses the Emotiv EPOC headset for EEG acquisition. Includes EEG responses from 21 subjects to 12 different stimuli, across 3 different chronologically disjoined sessions
* Signal Acquisition: 14-channel EEG signals were captured at a sampling frequency of 256 Hz as shown below.
* Baseline Results for Subject Identification Using the BED Dataset: shown below as Table IV.

