



Project Breakdown

Increased mental fatigue is leading to an increase in physical fatigue along with decreased workflow and injury in the manual material handling industry.

The primary purpose of the project is to detect mental fatigue in material handling workers. In order to complete this purpose, brain wave activity needs to be collected. The Emotive device is the tool that will be used to collect EEG data.

Objectives

Calibrate the Emotive device and learn the device

Design experiments for collecting data

Collect mental fatigue data using the Emotive device

Process the data to reduce noise

Analyze data and find results

Constraints

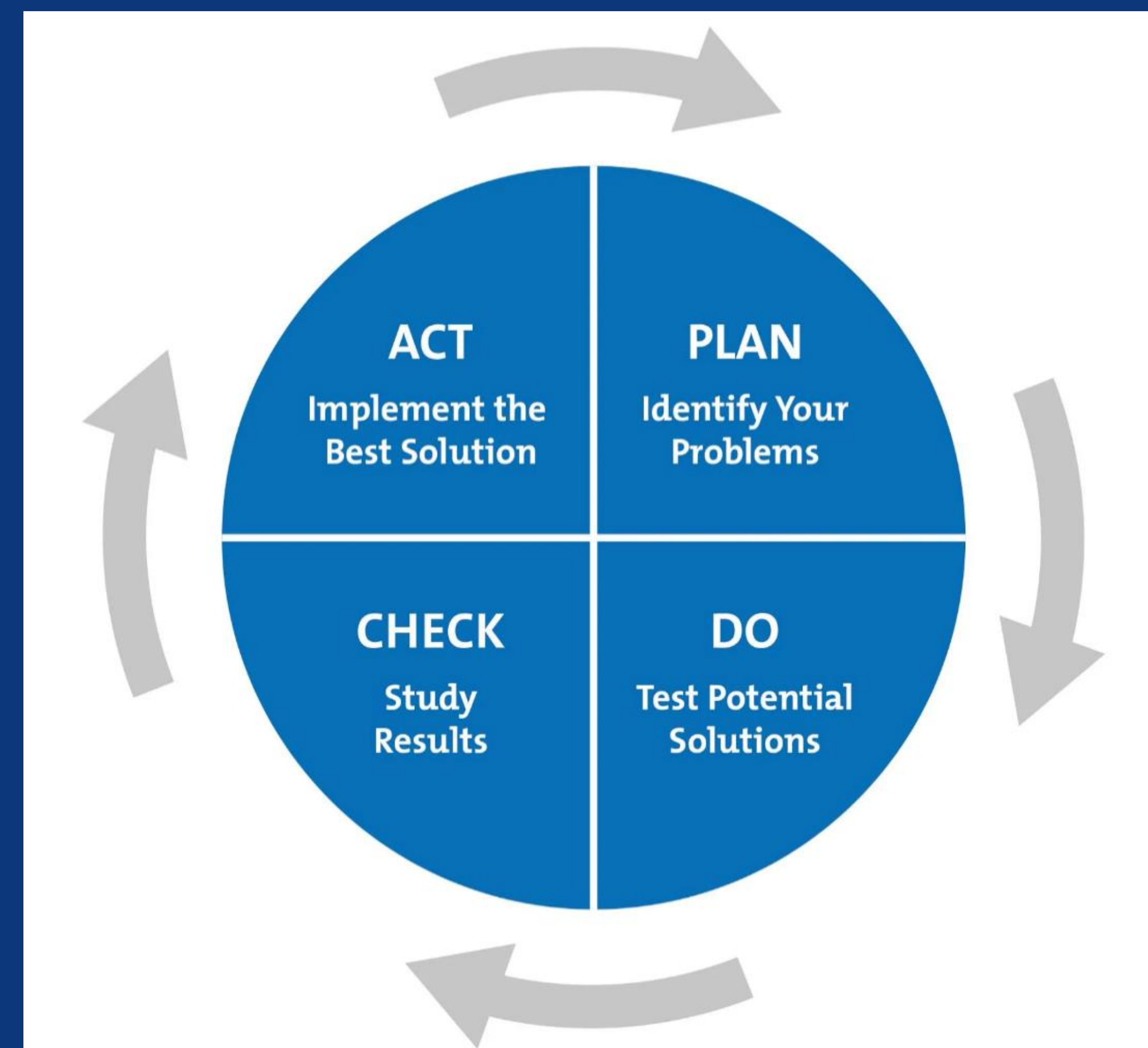
Time available to collect data

Budget

Quality of emotive device

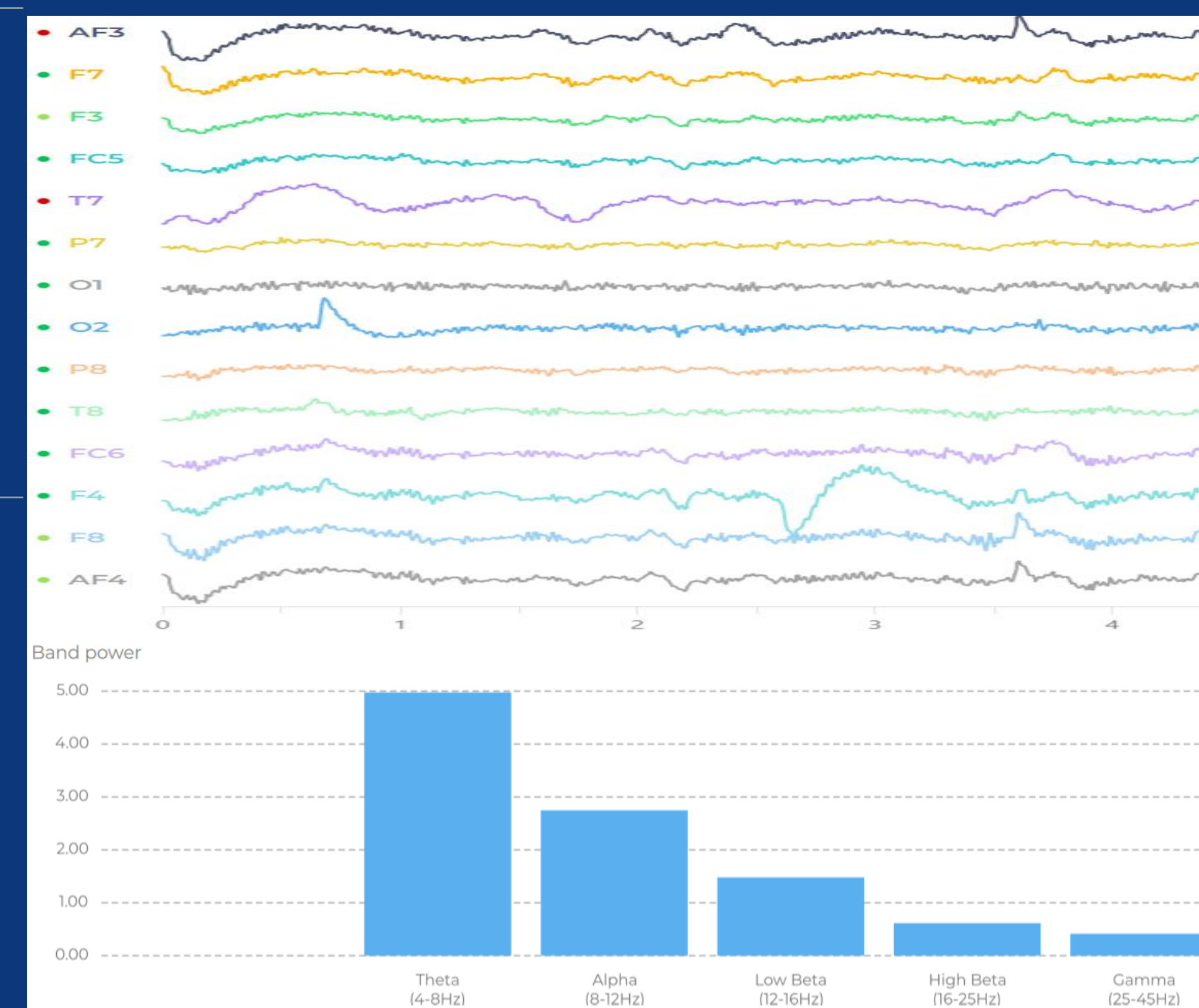
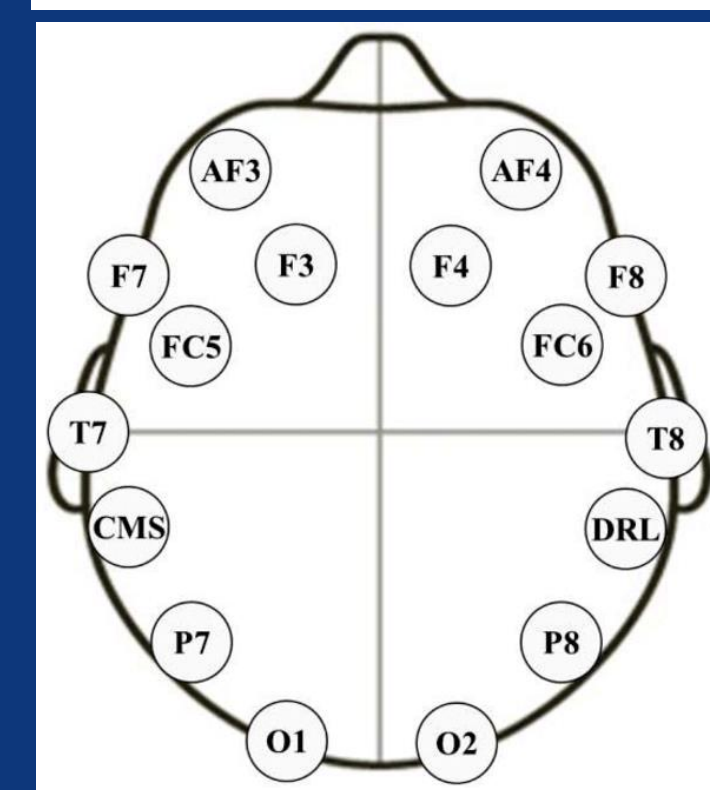
Human resources

Data and Problem-Solving Approach



- **Plan:** Calibrate the Emotiv device and understand how it works. Set objectives. Write a Statement of Work. Define Mental Fatigue and set up a Design of Experiment.
- **Do:** Design experiments for collecting Data. Wrap-up the Statement of Work. Perform experiments with and without music to model mental Fatigue.
- **Check:** Process data using the EEG Emotiv headset, clean the data, and build an ANOVA table.
- **Act:** Analyze data and propose recommendations/ conclusions, create a model to predict mental fatigue. Set up a digital twin presentation.

wave	frequency(Hz)	description
Theta	4 to 8	relaxed
Alpha	8 to 12	passive attention
Beta	12 to 35	active attention
Gamma	35+	concentration



Above is a description of each brain wave, a map of where each node is placed on a subject, and data collected with the emotive device. The data is from an experiment where the subject performed a color Stroop test.

Work completed:

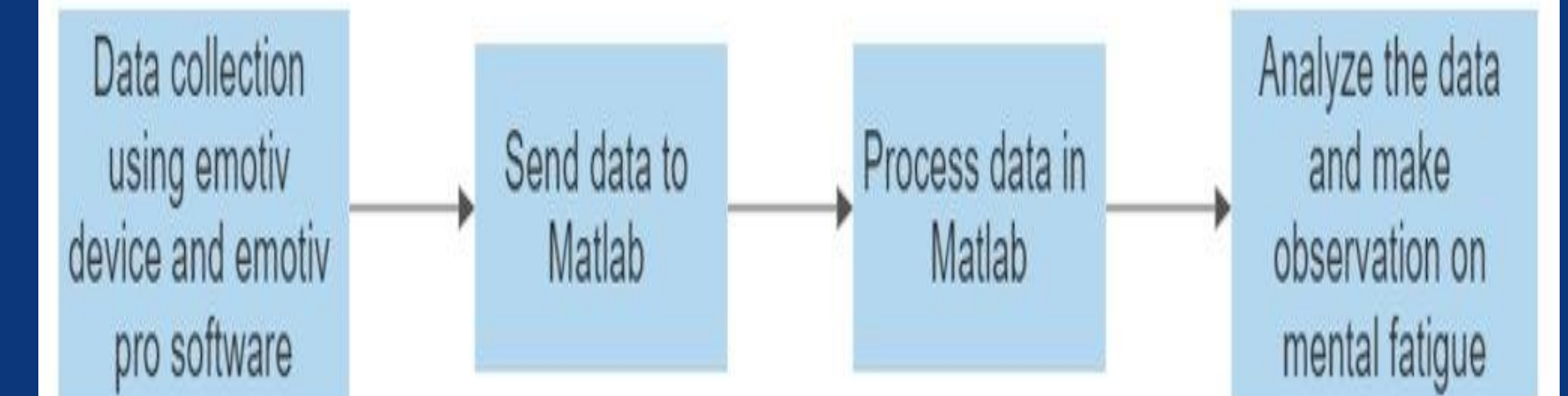
- Statement of Work
- Initial Design review
- Calibration and learning of device using preliminary data collection
- Literature review

Work to complete:

- Complete experiment design
- Collect EEG data pertaining to material handling workers
- Data processing in Matlab
- Analysis of data
- Final presentation

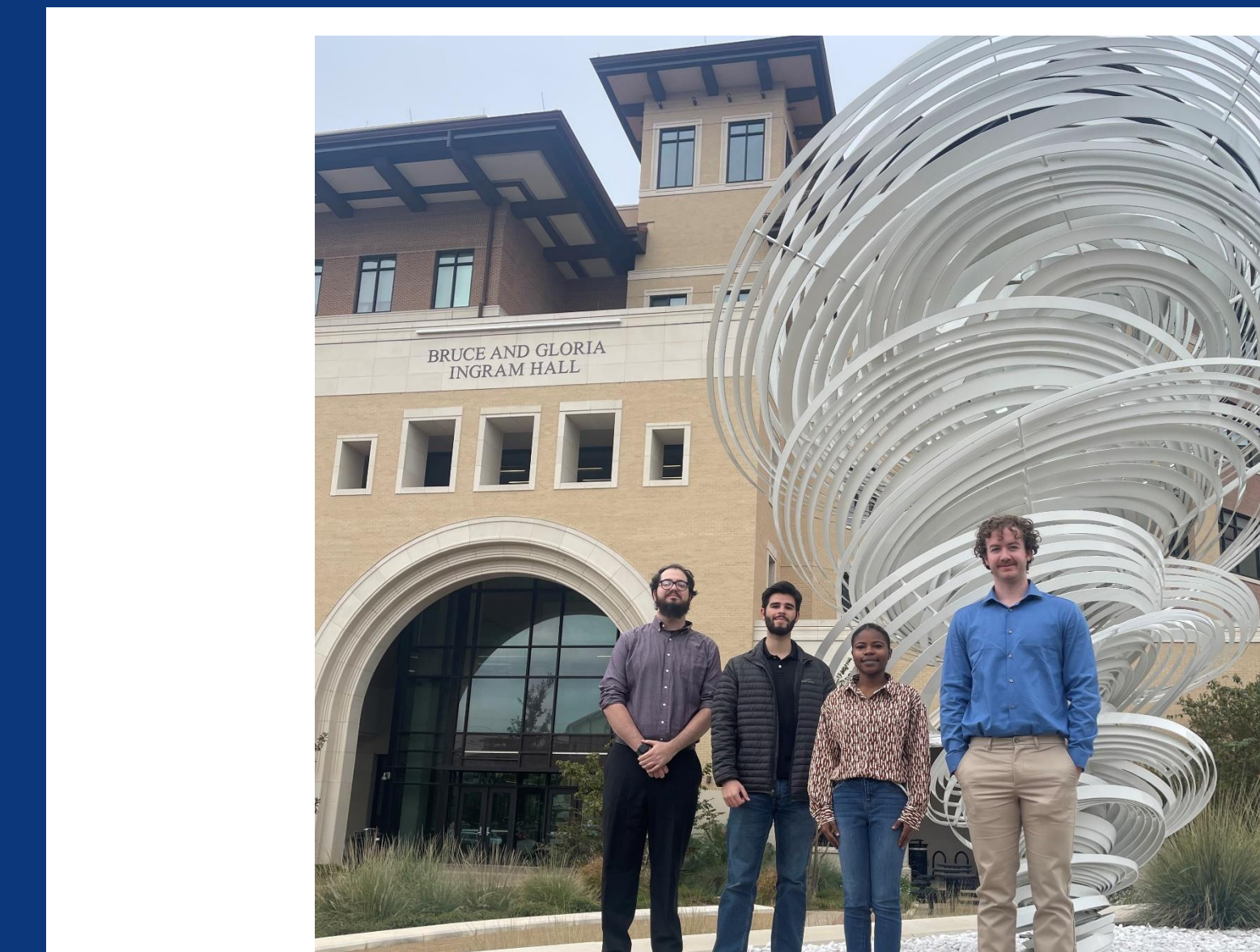
Visuals

Flow of Data



Human Factors

- This project requires experiments on humans so will need to ensure their safety in testing
- Protect subject from long term affects of mental fatigue



References:

- Dr. Jimenez
- Dr. Londa
- Dr. Ma
- Abhimanyu Sharotry