



## Project: Digital Biomarker Discovery for Eye Disorders using EEG Data

**Objective:** The objective of this project is to develop a digital biomarker using EEG data that can accurately identify individuals with eye disorders characterized by the need for long and stronger blinks. Students will analyze EEG signals obtained from four electrodes to find a biomarker that can be used to diagnose this eye disorder efficiently.

### Project Tasks:

#### 1. Data download and Preprocessing:

- Acquire EEG data from the provided four electrodes.
- Each file for both long and short blink contains session equally long (510 points pro session).
- Filter the EEG data.

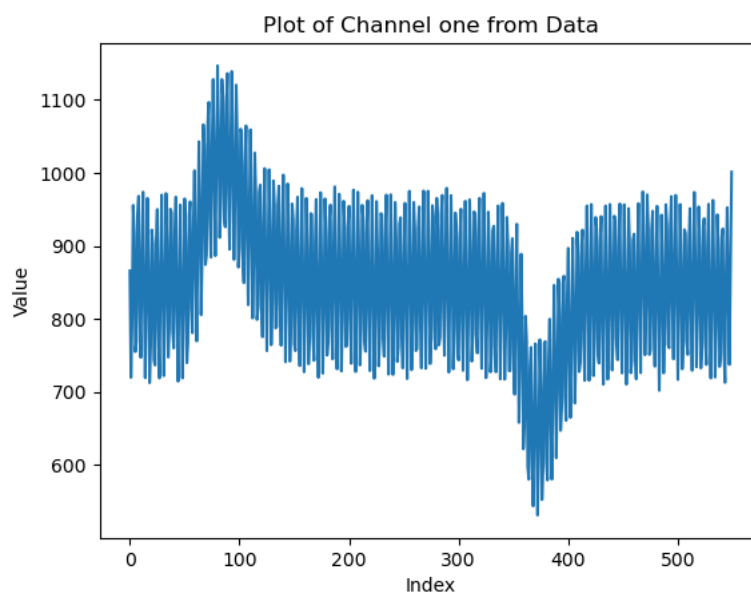


Figure 1: non-filtered EEG data of one of the channels for a long blink.

## **2. Feature Extraction:**

- Extract relevant features from the preprocessed EEG signals.
- Investigate which features might be indicative of the eye disorder.

## **3. Biomarker Selection:**

- Identify signal(s) that serve as a digital biomarker for the eye disorder.
- Consider techniques to ensure the biomarker's robustness.

## **4. Algorithm Development:**

- Develop a simple as possible algorithm that use the selected biomarker to detect the eye disorder in new patients.
- Ensure that the algorithm can efficiently process and analyze new EEG data.

## **5. Validation and Evaluation:**

- Validate the algorithm's performance using statistical tools.

## **6. Visualization of Biomarker:**

- Create visualizations to illustrate the selected digital biomarker.
- Provide clear and interpretable visual representations of how the biomarker correlates with the eye disorder.

## **7. Unseen Data Testing:**

- Prepare your algorithm to be able to run promptly on unseen EEG data to evaluate its ability to diagnose the eye disorder.

## **8. Documentation and Presentation:**

- Prepare a detailed report summarizing the project, including data preprocessing steps, feature extraction methods, biomarker selection process, algorithm development, and evaluation results (not more than 10 pages).
- Create a compelling presentation for the January 2024 presentation session, showcasing the biomarker and demonstrating the algorithm's performance on unseen data.

## **Grading and Evaluation:**

- The project and presentation together account for 100% of the final grade.
- Evaluation will be based on the effectiveness of the digital biomarker, the accuracy of the algorithm, the clarity of presentation and report, and the ability to run the code on unseen data successfully.

## **Timeline:**

- Project publication: 5.10.2023
- Project End Date: January (an explicit date will be announced together with other exams dates of the master's program).

## **Resources:**

- EEG data from four electrodes given on module.  
2 files: LongBlink.csv, ShortBlink.csv

Please note, this project is made with educational purposes and the code should not be provided as a medical software for patients. Furthermore, uploading the data in any form is prohibited.

This work is individual. Do not share codes, solutions, and ideas how to solve the project.