“Wearable device for epileptic seizure detection and prediction”

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Introduction: Epilepsy is a chronic noncommunicable disease of the brain that affects around 50 million people worldwide. It is characterized by recurrent seizures, and can have a broad spectrum of social consequences, impair quality of life and create psychosocial problems.

Considerable part of the disease burden is attributed to the unexpectable nature of seizures, thus automatic detection of events may facilitate early detection, timely intervention, and reduce the impact of epilepsy on patients' lives.

In order to build a device of real time signal acquisition and algorithm testing experiment system, we set some system requirement specifications, that are: frequency sample of 256Hz, 5 EEG channels, Real-time data acquisition, raw data accessibility, flexibility of electrode placement, approved for clinical trials, safe to use, comfortable and useable everywhere. We built a device that fulfills these requirements and satisfies the needs for clinical trails in Israel, as it satisfies all Helsinki committee requirements and is safe to use.

Methods: First, we chose which components will make up the device according to our project’s requirements, as stated above: Electrodes – we wanted dry and flexible electrodes, so we chose dry comb electrodes. Along we chose the electrodes band because it was suitable for our electrodes. Board – we wanted a board that analyzes 5 channels of EEG and 3 ECG signals, so we chose Cyton Board by OpenBCI, in addition to the dongle that comes along.

Second, we developed a real-time signal acquisition and algorithm testing experiment system for seizure detection and prediction trails using python, that saves the results and the signals acquired. We also built a GUI as a web app that presents the result of the algorithm for the user.

Results: we were able to build a comfortable and easy to wear system that acquires real-time EEG data with 0.1s latency, that records 5 EEG channels simultaneously, the experiment can last for hours and even days, as the system relies on AAA batteries and not rechargeable ones, the signals are processed it in order to detect or predict an epileptic seizure.

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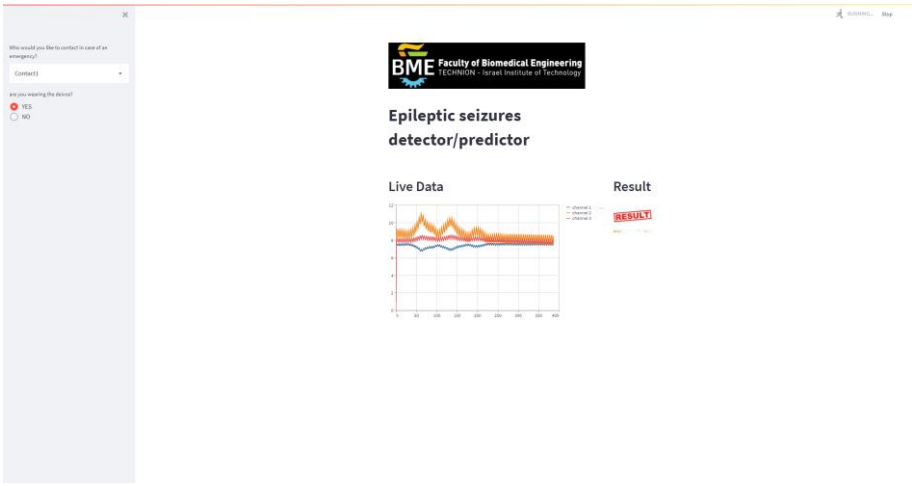

Conclusions: We built an experiment system that fulfill the specifications for the clinical trial.

Keywords: epilepsy, detection, prediction, EEG, real time

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