Implementation of Time Frequency Analysis for Seizure Localization, Phase II

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Epilepsy is generally diagnosed using electroencephalograms, or EEGs, which detect the electrical activity in a person's brain. Signals recorded from neurological tissue are extremely noisy, causing uncertainty in the analysis of EEG scans. The findings of this project additionally reveal that spectrograms do not strongly detect overtones, or specific harmonic frequencies, in the EEG scans which are necessary for accurate localization of absence seizures, the type of seizure investigated in this project. It is essential to find an alternative method of modeling to improve epilepsy analysis. In the first phase of this project, public EEG data of absence seizures was converted from a bipolar montage to a monopolar montage, which was necessary in order to test various methods of time-frequency analysis on this data. This year, this converted data was used to compare EEG analysis between the spectrogram, the most popular method of analysis, and the Cohen-Posch method, a newer process that has mathematical benefits to the spectrogram but has not been tested on EEG data. After extracting Cohen-Posch code into MATLAB and completing beta testing, both methods of time-frequency analysis were tested on 8 publicly available datasets of absence seizures in the CHB-MIT database. The Cohen-Posch method rescales the spectrogram to emphasize the harmonics of the fundamental frequency, necessary for the diagnosis of absence seizures. The emphasized harmonics allow for more precise detection of the seizure and more accurate detection of this fundamental frequency. These results may also be used for improving predictive models of absence seizures.