





Northeastern University **Center for STEM Education**

Introduction



Figure 1: An electroencephalogram used to measure the electrical activity in the brain of a woman. Source:

https://www.nhs.uk/conditions/electr oencephalogram/

- Electroencephalography (EEG) is used for the diagnosis and treatment of epilepsy.
- A marked difference in EEG signal pattern is observed during and before the onset of seizure.
- A machine learning algorithm to characterize EEG signals into seizure and non-seizure categories will be developed.

Background

- EEG signals range in frequency from 0 to 100 Hz
- EEG signal data from 3 epilepsy patients who were continuously monitored in a hospital, 23 EEG signal channels per patients



Figure 2: A graph of an EEG signal measurement taken over an hour at Boston Children's Hospital. As shown in the graph above, EEG signals undergo rapid oscillations during a seizure.

EEG Seizure Classification Using Power Analysis

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Simulation Method

- Used MATLAB and Simulink (MathWorks®)
- Used Support Vector Machine (SVM) linear classifier Model trained on a subset of data and tested on the rest,



Feature Extraction

Power of different frequency bands of an EEG Signal vs Time



power stabilizes very early on, after 300 seconds.

References: [1] CHB-MIT Scalp EEG Database. (n.d.). Retrieved July 25, 2019, from https://physionet.org/pn6/chbmit [2] Improving the Acquisition of EEG Signals. (n.d.). Retrieved July 25, 2019, from http://www.ece.neu.edu/news/improving-acquisition-eeg-signals [3] Publicly Available Code on:

MATLAB® Central. (n.d.). Retrieved July 25, 2019, from https://www.mathworks.com/matlabcentral/





Classification Accuracy

	Testing results from trained patients			Testing results from a new patient		
	Seizure	Non- Seizure	Total	Seizure	Non- Seizure	Total
Correct	72%	96%	84%	11%	100%	55%
Incorrect	28%	4%	16%	89%	0%	44%

Conclusion and Future Steps

- patients on which it was trained

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Results

 Model is successful at seizure detection in • However, further training is needed before it could be used on untrained patients • Eventually, one would want a model that could correctly identify a seizure prior to onset