Identifying the Epileptogenic Zone using Network Fragility Theory

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Technology description

Unmet Need

Epilepsy affects about 50 million people worldwide and approximately 40% of all individuals with epilepsy have intractable seizures, which cannot completely be controlled by medical therapy. The annual cost of assessing and treating patients with Medically Refractory Epilepsy (MRE) ranges from $3-4 billion in the US. 80% of these costs are accounted by patients whose seizures are not adequately controlled by anti-epileptic drugs. The main treatment for drug resistant epilepsy is surgery, which attempts to identify the epileptogenic zone (EZ) and remove the minimal amount of brain tissue responsible for generating seizures. Here, the method of determining the EZ involves looking at tens to hundreds of EEG signals without any computational tools to try to identify the electrode where the seizure started. The solution is a novel algorithm that treats the brain as a dynamic network and makes use of graph theory techniques.

Technology Overview

Johns Hopkins researchers have developed a computational method to improve the identification of epileptogenic zones in the brain. The EEG graph is advanced every second, but every snapshot contains a 5 second time window which helps to smooth the data. The data in each snapshot can be represented by a matrix whose elements are the aforementioned weights. From this, via eigenvalue decomposition, the centrality of each node is calculated, which is a measure of the relative importance of the node. The centrality data is turned into a time series, and then electrodes are clustered according to similar time signals.

Institution

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