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Research Area: Theory-Based, Data-Driven Event Detection

This research seeks to improve prediction of anomalous states in physiological and electronic-based physical systems. Approximately 3 million Americans and 50 million people worldwide have epileptic seizures. Epileptic seizures are an example of a physiological process that is difficult to predict. With the detection and forewarning of epileptic seizures, one can reduce or avoid the consequence of various medical crises, decrease patient hospitalization, and lower costs of health care and loss of productive time. Researchers currently analyze observations of electroencephalography (EEG) data to help predict when seizures will occur.

The major contribution of the research will involve analyzing the differences in phase space graphs using graph-theoretic dissimilarity measures. Such measures include calculations such as degree, node difference, link difference, algebraic connectivity, and topological invariants. Measurement of dissimilarity among phase space graphs is expected to improve the accuracy of predictive statistics which forewarn of events such as seizures.

Based on results from this study, the research team will apply these analytical techniques to other areas of study such as hardware failure prediction and cyber event detection.

Research Mentors:

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