Quantitative Methods for Understanding Coalescence and Fragmentation in Dynamic Networks of Epileptic Seizures

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Abstract:

Epilepsy is one of the most common neurological syndromes. The complexity of the network interactions which define the epileptogenic cortex and drive seizure initiation and spread makes understanding and treating epilepsy a unique challenge. In this talk I summarize work from our group with various collaborators over the past decade using statistical network methods to make progress towards meeting this challenge. We have increasingly progressed from coarse temporal resolution, static networks and simple statistics on single patients to fine temporal resolution, dynamic networks, and inferential statistics on patient cohorts. The talk will emphasize work from recent years, wherein we have introduced methods for (i) detecting dynamic communities that potentially split and/or merge ; and (ii) inferring the type of phase transitions undergone in epileptic seizures using random graph hidden Markov models for percolation in noisy dynamic networks.

Keywords:
Erdos-Renyi model; Achlioptas model; particle filtering; data augmentation; percolation