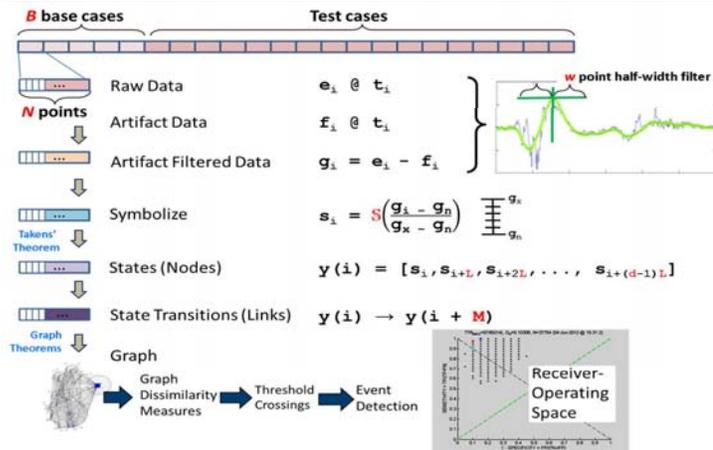


Improving Seizure Forewarning Using Graph Dissimilarity and Layout Analysis

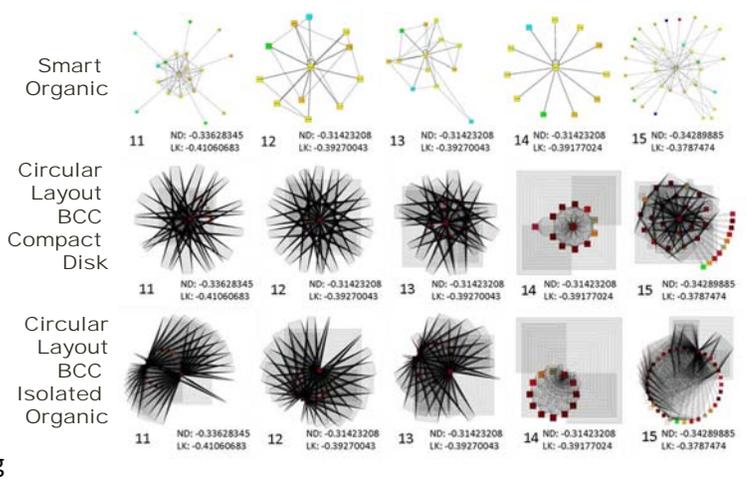
Theorem-based event detection



60 observation data sets (40 event / 20 non-event)
 Time-serial data analysis of EEG
 Time-delay-embedding theorem produces state vectors
 Novel states = nodes
 State-to-state transitions = links
 Nodes + Links = mathematical graph
Graph theorems to extract topological measures
 Dissimilarity measures for seizure forewarning

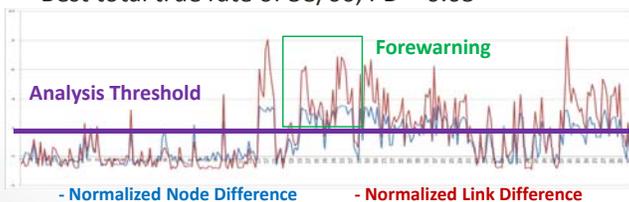
Graph properties

- Graph visualization
- Hundreds to thousands of nodes
- Typically thousands of links
- Pictorial layout: organic, hierarchical, circular
- Graph properties, such as
 - biconnected
 - planar
 - strongly connected
- Graph-theoretic measures as features
 - difference between number of nodes
 - difference between number of links
- Conversion of features into forewarning
 - analysis threshold gives yes (1) or no (0)
 - several successive occurrences give forewarning



Analysis framework

- Measures of success in seizure forewarning
- True positive (TP): correct prediction of an event
 - True negative (TN): no prediction in non-event data
 - False positive (FP): prediction of a seizure in non-event data
 - False negative (FN): no prediction of real event
 - Balance of TP and TN by prediction distance (PD)
 - Best total true rate of 58/60, PD = 0.05



Node and Link difference by cutset for one EEG observation
 Observation 45: Example of FP, No event, Forewarning indicated

