Degree Distribution Based Change Point Detection

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Complex systems of interacting elements, from human (social and organizational) to physical and biological ones, can be modeled as interaction networks. When the interactions are dynamic, a complete model that captures the longitudinal evolution of the system is comprised of a sequence of networks, each portraying a snapshot of the system at a single point in time.
Of specific interest, recently, is the analysis of changes in dynamic complex networks in response to events, and the automatic detection of these points of change. Understanding the network's reaction to unusual events provides improved abilities to analyze, understand and take actions in a given system, infer its reaction to events, and aid in predicting organizational and behavioral changes.
Past change point detection research used stochastic models, of either scalar values representing the longitudinal data, or probabilistic and model-based representations of the network, and did not examine the complex network's structure as manifested through distributions.
Here, we devise an online fast change points detection framework, utilizing the degree distribution changes in time. Unlike previous approaches, our method is size agnostic, and does not require either prior knowledge about the network's size and structure, nor does it require obtaining historical information or nodal identities over time.
Our framework was tested using both synthetic data and two real datasets, succeeds with both precision and recall and outperforms previous solutions. It can be utilized to explore the reaction of networks to events by classifying the nature of the reaction with respect to the resulted degree distribution.