1138-62-320 **Subhadeep Paul*** (paul.963@osu.edu), **Olgica Milenkovic**, **Yuguo Chen** and **Xiao Su**.
Higher-order structures based spectral clustering under a superimposed stochastic block model: Preliminary report. Preliminary report.

We consider a higher-order structures based spectral clustering method which attempts to find clusters in networks based on particular structures or motifs. We investigate the asymptotic consistency properties of the method under a signal and noise superimposition framework to generate random graph models for networks with over-abundance of certain network motifs or subgraphs. The signal model is a higher-order structure based model to resemble most relevant aspects of higher-order organization of the datasets under consideration, e.g., the widely used "triangle" motif or the "bi-fan" motif. The noise component is a dyadic random graph; either Erdos-Renyi random graph or directed and weighted extensions of that. We further propose a superimposed Stochastic Block Model (SBM) where the block structure is present only in the signal component and not in the noise component. We derive conditions on the maximum expected degree of a node in the graph for which the method is consistent under the superimposition SBM. We also prove that this condition can be relaxed if a regularization is performed. As a byproduct of our analysis, we prove consistency results of the higher-order spectral clustering method under the non-uniform hypergraph SBM. (Received February 12, 2018)