Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Eigenvalue Separation in the Laplacian Spectra of Random Geometric Graphs[1] AMY NYBERG, KEVIN E. BASSLER, Department of Physics, University of Houston — The graph Laplacian spectra of networks are important for characterizing both their structural and dynamical properties. As a prototypical example of networks with strong correlations, we investigate the spectra of random geometric graphs (RGGs), which describe networks whose nodes have a random physical location and are connected to other nodes within a threshold distance r. RGGs model transportation grids, wireless networks, and biological processes. The spectrum consists of two parts, a discrete part consisting of a collection of integer valued delta function peaks centered about the average degree and a continuous part that exhibits the phenomenon of eigenvalue separation. We examine the behavior of eigenvalue separation for large network size N in several scaling regimes based on the parameter α such that $N^\alpha r = c$ is constant. We identify a transition at $\alpha = 1/3$, above which the separated peaks get closer together as N increases and separation is eventually lost, but below which the peaks get farther apart. Also, an approximation for the expected number of separated peaks is given in terms of N and the average degree and we show that the expected number of peaks scales as N^α.

[1]This work was supported by the NSF through grant DMR-1206839 and by the AFSOR and DARPA through grant FA9550-12-1-0405.

Amy Nyberg
University of Houston

Date submitted: 14 Nov 2014

Electronic form version 1.4