Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Bounds for percolation thresholds on directed and undirected graphs[1] KATHLEEN HAMILTON, LEONID PRYADKO, University of California - Riverside — Percolation theory is an efficient approach to problems with strong disorder, e.g., in quantum or classical transport, composite materials, and diluted magnets. Recently, the growing role of big data in scientific and industrial applications has led to a renewed interest in graph theory as a tool for describing complex connections in various kinds of networks: social, biological, technological, etc. In particular, percolation on graphs has been used to describe internet stability, spread of contagious diseases and computer viruses; related models describe market crashes and viral spread in social networks. We consider site-dependent percolation on directed and undirected graphs, and present several exact bounds for location of the percolation transition in terms of the eigenvalues of matrices associated with graphs, including the adjacency matrix and the Hashimoto matrix used to enumerate non-backtracking walks. These bounds correspond t0 a mean field approximation and become asymptotically exact for graphs with no short cycles. We illustrate this convergence numerically by simulating percolation on several families of graphs with different cycle lengths.
Reference: K. E. Hamilton and L. P. Pryadko, PRL **113**, 208701 (2014).

[1]This research was supported in part by the NSF grant PHY-1416578 and by the ARO grant W911NF-11-1-0027

Kathleen Hamilton
University of California - Riverside

Date submitted: 14 Nov 2014 Electronic form version 1.4