Abstract Submitted
for the SES16 Meeting of
The American Physical Society

Diffusive Dynamics on a Network MADHURIMA NATH, Virginia Tech, YIHUI REN, NDSSL, Virginia Tech, YASAMIN KHORRAMZADEH, Center for Complex Network Research and Department of Physics, Northeastern University, STEPHEN EUBANK, Virginia Tech — The effect of the topology of a finite sized interacting system, modelled into a network, on its dynamics is an interesting question. Various methods have been proposed in the literature for building different equivalence classes or families of networks based on the structural aspects of the system. It is observed that similarities in the local statistics of two networks are not sufficient to predict the dynamics on them. We suggest a global statistic, the Moore and Shannon's network reliability polynomial that depends on both the structure and the dynamics to explore the behaviour of a diffusive process on a network. It gives the probability that a system composed of many different interacting components has a desired property. The computation of the reliability polynomial exactly is often NP-hard, but estimating it using Monte-Carlo simulation is feasible even for graphs with hundreds of millions of edges. The probabilistic nature of the polynomial allows the mapping of parameters of one network on to another using a simple transformation inspired by renormalization group approaches that keeps the dynamical phenomenon invariant.

Madhurima Nath
Virginia Tech

Date submitted: 07 Oct 2016 Electronic form version 1.4