SOE 12: Risks and Large Deviations in Economic Networks II

Time: Tuesday 11:45–12:00 Location: H37

SOE 12.1 Tue 11:45 H37

Large-deviation properties of simple energy-grid models — •Alexander K. Hartmann — Institute of Physics, University of Oldenburg

Here the large-deviation properties of a simple model of the stability of energy grids and other transport networks are studied numerically [1]. The model is based an the shortest-path edge centrality which is used to estimate the amount of additional reserve capacity which must be available to prevent cascading failures upon the failure of the most important connections. The large-deviation properties of the distribution of this reserve capacity are obtained using specifically biased [2] Monte Carlo simulations. This allows to obtain the distribution easily in regions where the probabilities are as small as 10^{-40}. In particular the most resilient (optimum) as well as the least resilient (worst) networks are obtained during the simulations. The results, in particular fits to assess the shape of the distributions are obtained for different graph ensembles like two-dimensional diluted grids, Small-World networks and Erdős-Rényi random graphs.

[1] A.K. Hartmann, *Practical Guide to Computer Simulations* (World-Scientific, Singapore, 2009)

[2] A.K. Hartmann, Sampling rare events: statistics of local sequence alignments, Phys. Rev. E **65**, 056102 (2002)