

Robust Communication Dynamics in Complex Networks

Saturday December 13, 2003

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<http://www.research.ibm.com/nips03workshop/>

Large-scale networks with complex patterns of communication between elements abound in both nature and in man-made systems (e.g., genetic pathways, ecological networks, social networks, networks of scientific collaboration, Internet, World Wide Web, phone-call networks, power grid etc.). The main objective of this workshop is to explore how various local communication schemes in distributed systems (e.g., gossip-style/epidemic protocols) and message-passing schemes for inference (e.g., Belief Propagation, Survey Propagation) may robustly achieve global objectives, such as accurate global computation, in the presence of various forms of noise, errors and attacks, and how their performance is affected by network dynamics and topology.

The workshop aims at cross-fertilization among several research areas that has attracted an immense current interest. The first builds upon last year's highly successful NIPS workshop on Propagation Algorithms on Graphs with Cycles, which focused primarily on the theory of Belief Propagation in Bayesian Networks. The second research area is distributed machine learning which was touched upon in last year's NIPS workshop on Multi-Agent Learning. The final research area, statistical dynamics of complex network phenomena, is a rapidly burgeoning multi-disciplinary research topic that combines methods from computer science, statistical physics, nonlinear dynamics, econometrics and social network theory to study common problems in many systems exhibiting complex network structure. This topic has attracted much recent attention in the scientific literature as well as in popular publications (e.g., D. Watts, "Six Degrees: The Science of a Connected Age," 2003), but so far has not been presented at NIPS.

Robust Communication Dynamics in Complex Networks (Day 2)

Saturday December 13, 2003

Organizers: Rajarshi Das & Cristopher Moore & Irina Rish & Gerry Tesauro

Saturday morning session: 7:30am–10:35am

7:30am **Microscopic approaches for the discovery of web communities**, *Tsuyoshi Murata*

7:50am **Modelling dynamics of information networks**, *Martin Rosvall and Kim Sneppen*

8:10pm **The surprising power of epidemic protocols**, *Kenneth Birman*

8:45am *coffee break*

9:05am **Epidemic models of communication in networks**, *Jon Kleinberg*

9:40am **Scalable and attack resistant peer-to-peer networks**, *Jared Saia*

10:15am **Scalable Byzantine agreement**, *Clifford S. Lewis and Jared Saia*

Saturday afternoon session: 4:00pm–7:00pm

4:00pm **Extreme fluctuations in small-worlds with relaxational dynamics**, *Gyorgy Korniss*

4:35am **Validity estimates for belief propagation on random graphs**, *Bert Kappen*

5:10pm *coffee break*

5:30pm **Constraint satisfaction networks: belief propagation and beyond**, *Marc Mezard*

6:05pm *panel/wrap-up discussion*