Robust Communication Dynamics in Complex Networks

Friday December 12, 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.

In this workshop, there will be two tutorials (30 min each), 10 invited talks (35 min each), 5 contributed talks (20 min each), as well as several posters presented in the poster sessions.

Robust Communication Dynamics in Complex Networks (Day 1)

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

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

7:30am **Introduction: workshop scope and goals**, *Irina Rish*

7:45am **Mini-tutorial on complex networks**, *Cristopher Moore*

8:15am **Finding patterns in large graphs**, *Christos Faloutsos*

8:50am *coffee break*

9:10am **Community structure in complex networks**, *Michelle Girvan*

9:45am **How do networks become navigable?**, *Aaron Clauset and Cristopher Moore*

10:05am *poster highlights, poster session to continue over the break*

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

4:00pm **Mini-tutorial on belief propagation and free energy minimization**, *Jonathan Yedidia*

4:30pm **Belief propagation and transform codes**, *Jonathan Yedidia*

5:00pm **On the choice of clusters for generalized belief propagation**, *Max Welling*

5:35pm *coffee break*

5:55pm **Distributed inference in sensor networks**, *Mark Paskin and Carlos Guestrin*

6:15pm *posters/discussion*