

TALK ANNOUNCEMENT

Seminar Series: The Science of Complex Networks (description below)

Speaker: Chalee Asavathiratham, Senior Analytics Engineer, Pivotal Systems Corporation

Title: The Influence Model: A Tractable Model of Networked Markov Chains

Abstract: Please see below.

Date & Time: Monday, March 13, 2006. 4:00-5:00 PM

Location: Virginia Tech Corporate Research Center, Building XV, Conference room 2018

Web: <http://ndssl.vbi.vt.edu/seminars>

Abstract

What do the following have in common: viral marketing, cascading failures in power networks, and disease contagion? In an abstract sense, these examples all consist of a network and dynamical interaction among the nodes. In this talk, we introduce The Influence Model (IM), a particular but tractable mathematical representation of random, dynamical interactions on networks. Specifically, an IM consists of a network of nodes, each with a status that evolves over time. The evolution of the status at a node depends not only on the current status of that node, but also on the statuses of neighboring nodes.

More technically, the IM can be viewed as a type of Dynamic Bayesian Network, in which the next-status probability distribution of a node depends on the current statuses of its neighbors in a quasi-linear form. We show that certain aspects of the dynamics of the model can be studied through the influence matrix, a reduced-order matrix whose dimension is the sum rather than the product of the local chain dimensions. We explore the eigenstructure of the influence matrix and describe how it is connected to the full-order transition matrix. We show a nested hierarchy of higher-order influence matrices, which allow us to achieve scalable computations on the joint-statistics. Originally conceived as an abstract model for cascading failures for power blackouts, the IM has been independently applied in the context of viral marketing, social interaction and information diffusion on networks.

Seminar Series: "The Science of Complex Networks"

A new seminar series titled "The Science of Complex Networks" is being started. It is organized by the group NDSSL at VBI, on the web at <http://ndssl.vbi.vt.edu>. The theme of the seminar is mathematical and computational aspects of dynamics over large graphs. Examples include the dynamics on networks in communication, urban traffic systems, and networks arising in biological systems such as the molecular networks in the genome and the immune system.

The systems and network models that come from these various areas describe very different phenomena and dynamics and may seem to have little in common. Contrary to this intuition, there are large classes of models with fundamental similarities in both structure and dynamics. This common and generic structure has already motivated research, and is an extremely active area of current research.

The seminars will have a formal flavor, and at least proof ideas and outlines will be encouraged. Presentations of experimental data and findings displaying interesting phenomena that point to possible general results are also welcome.