

TALK ANNOUNCEMENT

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

Speaker: T. M. Murali, Department of Computer Science, Virginia Tech

Title: Automatically Assembling the Building Blocks of Cellular Circuitry

Abstract: Please see below.

Date & Time: Monday, March 27, 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

Publicly-available data sets provide detailed and large-scale information on diverse types of molecular interaction networks in a number of model organisms. These multi-modal universal networks capture a static view of cellular state. It is becoming increasingly popular to impart a degree of dynamism to these networks by integrating them with gene expression measurements taken under multiple conditions.

We present a novel approach that yields a dynamic and multi-dimensional view of cell circuitry by integrating molecular interaction networks, gene expression data, and descriptions of cell states. Our approach has three key ingredients:

- (i) We express similarities and differences between multiple cell states or conditions as a set-theoretic formula whose elements are the cell states.
- (ii) We equate each formula with a network lego, a sub-network of coherently activated molecular interactions that uniquely characterizes the relationships between cell states related by that formula. Each network lego is a potential building block of cellular circuitry.
- (iii) We construct the union of all the formulae, which is a directed acyclic graph whose leaves are cell states. This graph provides a novel hierarchical representation that places different cell states in context with respect to each other.

We apply our method to a diverse collection of data sets in baker's yeast and human. We discover numerous network legos that are statistically significant, functionally enriched, and multi-modal. This work is joint with Corban Rivera.

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.