

Public Abstract

First Name:Allison

Middle Name:N

Last Name:Tegge

Adviser's First Name:Dong

Adviser's Last Name:Xu

Co-Adviser's First Name:

Co-Adviser's Last Name:

Graduation Term:FS 2012

Department:Informatics

Degree:PhD

Title:Using correlation profiles for understanding pathway perturbations

Identifying perturbed or dysregulated pathways is critical to understanding the biological processes that change within an experiment. Previous methods identified important pathways that are significantly enriched among differentially expressed genes; however, these methods cannot account for small, coordinated changes in gene expression that amass across a whole pathway. In order to overcome this limitation, we developed a novel computational approach to identify pathway perturbation based on pathway correlation profiles. Overall, our method made significant predictions as to the pathway perturbations that are involved in the experimental conditions.

Further, I can use these pathway correlation profiles to better understand pathway dynamics and modules of regulation. I have applied this developed method to the Ribosome pathway for several model organisms and various tissue types, where I was able to isolate alternative regulation patterns for each species and tissue. In addition, I have applied these pathway correlation profiles for the MAPK pathway to help characterize the disease progression of colon cancer from normal tissue, through all four stages, culminating in final metastasis. The pathway correlation profile method allows for more meaningful and biologically significant interpretation of the current data available.

In short, we developed a novel computational method for identifying pathway perturbation. This method is a powerful tool that better utilizes gene expression data when studying pathway dynamics in regards to biological processes. Moreover, this method provides hypotheses for understanding the mechanisms within meaningful pathways, and where the pathway dynamics change across conditions.