Revealing genome-scale connection between Alzheimer’s disease and cardiovascular diseases by a systems-biology analysis

Weixiong Zhang
Department of Computer Science and Engineering
Department of Genetics
Washington University in St. Louis

Tuesday, April 7, 2009 3:00pm
Marvin Danto Auditorium Engineering Bldg.

Abstract:
Late-onset Alzheimer’s disease (AD) is the most common dementia; it starts with progressive memory impairment with deficits in executive functioning, language, visual-spatial abilities, personality, behavior and self-care. AD affects the aging population around the world and causes serious public health problems. Unfortunately, due to its polygenic nature (meaning that a large number of genes are involved in the disease), AD has not yielded to conventional strategies for elucidating genetic mechanisms and for identifying genetic risk factors.

My talk will consist of two parts. The first part will focus on our approach to and findings on AD. After briefly describing the AD pathology and AD-related pathways, I will present a general systems-biology approach to study complex diseases, such as AD. I will particularly discuss our study on a set of laser-captured single cell-type microarray gene expression data from normal and AD brains, and our results that connect AD with cardiovascular diseases and diabetes.

In the second part of my talk, I will discuss one of the two key components of our systems-biology approach, i.e., a method for constructing a co-expression network from microarray gene expression data and a method for identifying community structures (modules) from the network. This analysis helped us identify a co-expressed (and also co-regulated) gene module that contains a large number of disease associated genes.

The talk is prepared for a broad audience, so little prior knowledge of AD or computational biology is required.

Bio:
Weixiong Zhang is a full professor in Computer Science and Genetics at Washington University in St. Louis, Missouri. He received his B.S. and M.S. in computer engineering from Tsinghua University, Beijing, China, and his M.S. and Ph.D. in computer science from University of California at Los Angeles (UCLA). Before joining Washington University in 2000, he was a senior research scientist at USC/Information Sciences Institute. Professor Zhang’s research interests include computational biology and genomics, artificial intelligence (heuristic search, machine learning, constraint optimization, distributed multi-agent systems), data mining, and combinatorial optimization. He has published more than 100 papers in these areas and is the author of a research monograph, State-Space Search: Algorithms, Complexity, Extensions and Applications, published by Springer in 1999. He is currently Associate Editors of PLoS Computational Biology, J. of Alzheimer’s Disease, Artificial Intelligence and AI Communications, and serves on the editorial boards of J. of Artificial Intelligence Research and The Opens Systems Biology Journal.