

EE Department Seminar

March 8, 2010, Monday, 3 p.m.
Yorgo I Stefanopulos Meeting Lounge (KB 217)

From Sequence to Function to Network: Analysis Issues in Bioinformatics

Hasan H. Otu

Harvard Medical School – Boston, USA

Bioinformatics has emerged as an interdisciplinary field applying computational approaches to problems in life sciences, which generates large amounts of data by means of ever growing technological advancements. Three facets of interest include i) Data Storage and Management (server/hardware design, ontology/database development), ii) Data Analysis (algorithm/software development), and iii) Data Interpretation (putting the results into biological and/or clinical context). In this talk, I will focus on data analysis issues by giving a broad overview of research problems followed by our own studies. These issues include: i) DNA and protein sequence analysis (pairwise/multiple alignment, gene finding, fragment assembly, phylogenetic reconstruction), ii) protein folding/structure prediction, iii) functional genomics and proteomics (microarrays), and iv) networks approach (along the lines of systems biology). In particular, we have tried to characterize and use structure and complexity of information in DNA sequences using average mutual information profiles and Lempel-Ziv complexity. These ideas have been applied to sequence assembly and evolutionary analysis through defining distance between DNA sequences. We have also used microarray platforms (transcriptional, SNP, proteomic, methylation, microRNA) to analyze various biological and clinical states such as cancer, diabetes, stem cells, and heart disease. I will give example studies demonstrating certain issues and results involved in functional genomics and proteomics. I will conclude by our approach to analyzing high throughput biological data within the context of networks using Bayesian Network theory.

Hasan H. Otu obtained his BS degree in 1996 and MS degree in 1997, both from Bogazici University, Department of Electrical and Electronics Engineering. He graduated from University of Nebraska-Lincoln with a PhD in Electrical Engineering in 2002. He was a research fellow at Harvard Medical School between 2002-2003 and then an Instructor in Medicine since then. He is director of Bioinformatics Core at Beth Israel Deaconess Medical Center's Genomics Center of Harvard Medical School and Associate Director of Proteomics Core at Dana Farber Harvard Cancer Center. He has been shuttling between US and Turkey since 2006 first as part of a sabbatical and then through a Harvard Foundation grant supporting his research efforts in Turkey.