Introduction to Bioinformatics
20 BME 643
Winter Quarter 2004

Catalog Description: 20BME 643. Modeling aspects, biological motivation, problem formulation and solution as well as reference to bioinformatics tools.


Coordinator: Jarek Meller, Ph.D., Pediatric Informatics, Children’s Hospital

Goals: Students will gain an understanding of central algorithmic issues underlying computational studies in genomics

Prerequisites: Basic (undergraduate level) design of algorithms or permission by instructor.

Topics:
1. Biological motivations, central problems, algorithms and application
2. Sequence Analysis as a central problem in bioinformatics
   a. Exact string matching, applications to sequence pattern finding and genomic sequence assembly
   b. Dynamic programming, applications to finding sequence similarity
3. Gene and protein expression analysis
   a. Cluster analysis, applications to analysis to expression profiles
   b. Supervised learning, applications to correlations of expression fingerprints and phenotypes
4. Analysis of protein structure and interactions
   a. Profile Hidden Markov Models, applications to protein domain discovery
   b. Graph theory, applications to representations of protein interaction networks
5. Evolution and phylogenetic analysis
   a. Phylogenetic trees and their applications
   b. Combinatorial approaches to genomic rearrangements
6. Overview of other problems

Computer Usage: Computer Modeling Lab, equipped with the necessary software

Laboratory Projects: At least one hands-on class per blocks 2 through 5

Design Projects: Problem solving assignments for each of the blocks