

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.
Textbook(s):	Suggested textbooks include: Durbin, Eddy, Krogh and Mitchinson, "Biological Sequence Analysis"; Pevzner, "Computational Molecular Biology"; Gibson and Muse, "A Primer of Genomic Science"; Schwarz and Christianen, "Learning Perl".
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:	<ol style="list-style-type: none">1. Biological motivations, central problems, algorithms and application2. Sequence Analysis as a central problem in bioinformatics<ol style="list-style-type: none">a. Exact string matching, applications to sequence pattern finding and genomic sequence assemblyb. Dynamic programming, applications to finding sequence similarity3. Gene and protein expression analysis<ol style="list-style-type: none">a. Cluster analysis, applications to analysis to expression profilesb. Supervised learning, applications to correlations of expression fingerprints and phenotypes4. Analysis of protein structure and interactions<ol style="list-style-type: none">a. Profile Hidden Markov Models, applications to protein domain discoveryb. Graph theory, applications to representations of protein interaction networks5. Evolution and phylogenetic analysis<ol style="list-style-type: none">a. Phylogenetic trees and their applicationsb. Combinatorial approaches to genomic rearrangements6. 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