CAP 5510: Introduction to Bioinformatics (3 cr)
Spring 2007: Tu Thu 11-12:15 in ECS 141

Justification & Course Overview

This is an introductory graduate course in Bioinformatics. You will learn standard tools and techniques used to analyze and interpret biomedical data. There is considerable overlap with areas such as data mining, machine learning, pattern recognition, and algorithms. No prerequisite knowledge in biological sciences will be assumed.

Prerequisite Knowledge

Data Structures & Algorithms, Discrete Math, Probability & Statistics.

Topics

- Fundamentals of Biology, Statistics, and the Internet
- Overview of Bioinformatics, Computational Biology and Biotechnology
- **(*)** Databases and Software Packages, BioPerl.
- **(*)** Sequence Alignment: problems and algorithms
- **(*)** Multiple Sequence Alignment
- **(*)** Phylogenetic Analysis
- Sequencing and Mapping
- **(*)** Predictive Methods: Nucleotide Sequences and Protein Sequences
- **(*)** Pattern Discovery Techniques and applications
- **(*)** Machine Learning Methods: Neural Networks, Hidden Markov Models, Self-Organizing Maps, Support Vector Machines, etc.
- **(*)** Molecular Structural Analysis
- **(*)** Analysis of Gene Expression Data
- Predicting Regulatory Elements, RNA Interference, and Alternative Splicing
- Comparative Genomics

The course will contain a lab component to learn Bioinformatics analysis tools. The tentative list of topics covered by the lab component are marked with a **(*)**.

Texts and References

[Required]
- *Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins*, Eds. A. D. Baxevanis and B. F. Ouellette, Wiley Interscience, 3rd ed., **ISBN**: 0471478784, 2005.
- *Bioinformatics – Sequence & Genome Analysis,* David Mount, CSHL Press, Paperback, 2nd ed., 2004, **ISBN:** 0879697121

[Reference]
- *Developing Bioinformatics Computer Skills,* Gibas & Jambeck, O'Reilly Publishers.
- *Algorithm on Strings, Trees, and Sequences*, Gusfield, Cambridge Univ. Press, 1997.
- *Biological Sequence Analysis*, Durbin, Eddy, Krogh & Mitchison, Cambridge Press.
- *Bioinformatics: The Machine Learning Approach*, P. Baldi and S. Brunak. MIT Press.

Course web page: http://www.cs.fiu.edu/~giri/teach/BioinfS07.html