Giri Narasimhan

CAP 5510: Introduction to Bioinformatics (3 cr)
Spring 2011: Tu Thu 9:30-10:45 in ECS 134

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 molecular and cell biology, genetics, or biochemistry will be assumed.

Prerequisite Knowledge

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

Topics

- Fundamentals of Biology, Statistics, the Internet, and Bioinformatics
- Databases and Software Packages, BioPerl.
- Sequence Alignment, Multiple Sequence Alignment
- Sequencing; Next Generation Sequencing & Applications
- Predictive Methods: Nucleotide Sequences and Protein Sequences
- Pattern Discovery Techniques and applications
- Machine Learning: NN, HMM, SOM, SVM, etc.
- Gene Regulation; Predicting Regulatory Elements
- Analysis of Gene Expression Data
- Gene Ontology and Pathways; Protein-protein interactions
- Genomics, Proteomics, Comparative Genomics
- Phylogenetic Analysis
- Molecular Structural Analysis: RNA and Proteins
- Genetics and Genome-Wide Association Schemes
- Single Nucleotide Polymorphisms
- Advanced Topics: RNAi, Alternative Splicing, Epigenetics

The course will contain a lab component to learn Bioinformatics analysis tools.

Texts and References

[Recommended]

- *Bioinformatics and Functional Genomics*, J. Pevsner, Wiley-Blackwell, 2nd Edition, **ISBN**: 978-0-470-08585-1

[References]

- *Bioinformatics* Algorithms, Eds: Mandoiu and Zelikovsky, Wiley, 2008.
- 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
- *Developing Bioinformatics Computer Skills,* Gibas & Jambeck, O'Reilly Publishers.
- *Algorithm on Strings, Trees, and Sequences*, Gusfield, Cambridge Univ. Press, '97.
- *Biological Sequence Analysis*, Durbin, Eddy, Krogh & Mitchison, Cambridge Press.

- *Introduction to Bioinformatics*, by Arthur M. Lesk, 3rd Edition, Oxford Press, 2008.
- *Bioinformatics: The Machine Learning Approach*, P. Baldi and S. Brunak. MIT Press.

Course web page: http://www.cs.fiu.edu/~giri/teach/BioinfS11.html