

CAP 5510: Introduction to Bioinformatics (3 cr)
Fall 2018: Mon 5:00 – 6:15 PM, ECS 138

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, information retrieval, 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
 - Gene Ontology and Pathways; Protein-protein interactions
 - Genomics, Transcriptomics, Proteomics, Metagenomics
 - Phylogenetic Analysis
 - Molecular Structural Analysis: RNA and Proteins
 - Genetics and Genome-Wide Association Schemes
 - Single Nucleotide Polymorphisms
 - Advanced Topics: RNAi, Alternative Splicing, Epigenetics; Microbiomes
- The course will contain a lab component to learn Bioinformatics analysis tools.

Texts and References

[Recommended]

- *Bioinformatics and Functional Genomics*, J. Pevsner, Wiley-Blackwell, 3rd Edition, ISBN-13: 978-1118581780; ISBN-10: 978-1118581784

[References]

- *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
- *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/BioinfF18.html>