Giri Narasimhan

CGS 5166: Bioinformatics Tools (2 cr)
Fall 2018: Mon 5:00 – 6:15 PM, ECS 138

Justification & Course Overview

This course will introduce computational tools and techniques for analyzing biomolecular (DNA, RNA, protein) sequences, structures, and quantitative data arising from biological experiments. The students will also learn about the major databases and repositories of bioinformatics information. No background in Computer Science will be expected. However, knowledge of basic molecular biology and ability to run statistical and software tools will be useful.

Prerequisite Knowledge

Introductory course in Molecular Biology, Genetics, and Cell Biology.

Topics

- Fundamentals of Biology, Statistics, the Internet, and Bioinformatics
- Databases and Software Packages: GenBank, SwissProt, BioPerl.
- Sequence Alignment, Multiple Sequence Alignment: BLAST, CLUSTAL
- Sequencing, Assembly & Applications: VELVET
- Pattern Discovery: PROSITE, Pfam,
- Predictive Machine Learning Tools: HMMPro, GeneCluster, SVMLite.
- Transcriptomics, Gene Regulation: RegulonDB, MAS, GeneSpring
- Ontology and Pathways – Databases and Analysis: GO, KEGG
- Genomics, Proteomics, Comparative Genomics: GreenGenes
- Phylogenetic Analysis: PHYLIP, PAUP
- Molecular Structural Analysis – RNA & Proteins: RASMOL, DALI
- Genetics and Genome-Wide Association Schemes
- Single Nucleotide Polymorphisms and SNP Databases
- 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