Spring 2-1-2004

CS 595.02: Introduction to Bioinformatics

Changwon Yoo
University of Montana, Missoula

Computer Science 595
Introduction to Bioinformatics
3 credits

Instructor: Changwon Yoo, Assistant Professor
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Office Hours: Mons. 2-3pm / Thurs. 2-3pm
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Description:

This course will introduce and use biological data sources available in the post *human genome project* era. Topics will include basic algorithms for alignment of genome sequences and prediction of protein structures, as well as more advanced representational and algorithmic issues in protein structure, genome sequence computation, and systems biology. Also this course will discuss of state of the art bioinformatics projects that are being developed between the department of computer science and the school of pharmacy and allied sciences.

Format: Two classes per week.

Offered: Spring semester 2004

Prerequisites: Consent of Instructor

Materials: Articles and a text book:
Bioinformatics: Sequence and Genome Analysis by David W. Mount
Publisher: Cold Spring Harbor Laboratory; 1st edition (March 15, 2001)
ISBN: 0879696087

Assessment of Student Performance: Attendance (15%) / Homework (40%) / Project + Presentations (45%)

Meetings (2004): Tues/Thurs 9:40am-11:00am (SS 362)

Class Conduct:

Plagiarism on homework assignments, cheating on tests, use of inappropriate language (oral or written), or misuse of the computer facilities will not be tolerated. Offenders will be prosecuted to the fullest extent of the University Student Conduct Rules.

Lecture Outline:

Date	Topic	Required Readings and Other Info
Jan. 27, Tues.	Introduction to Bioinformatics and Computational Genomics / Course Overview	• Mount Readings: Chapters 1,2
Jan. 29, Thurs.	Introduction to Bioinformatics and Computational Genomics (cont.)	• Mount Readings: Chapters 1,2
Feb. 3, Tues.	Dynamic Programming Sequence Alignment	• Mount Readings: p 51-119, p 282-315
Feb. 5, Thurs.	Multiple Sequence Alignment	• Mount Readings: p 140-160, 192-200
Feb. 10, Tues.	Terminologies and Ontologies	• Gene Ontology Web site
Feb. 12, Thurs	Gene finding algorithms	• Mount Readings: Chapter 8
Feb. 17, Tues.	Comparative genomics algorithms, Genome Alignment	• Mount Readings: p 479-518
Feb. 19, Thurs.	Comparative genomics algorithms, Genome Alignment (cont.)	• Mount Readings: Chapter 6
Feb. 24, Tues.	Phylogenetic algorithms	• Mount Readings: Chapter 6
Feb. 26, Thurs.	1D Motifs, Algorithms and Databases	• Mount Readings: p 161-185
Mar. 2, Tues.	RNA secondary structure, Intro to Microarrays	• Mount Readings: Chapter 5
Mar. 4, Thurs.	RNA secondary structure, Intro to Microarrays (cont.)	• Mount Readings: Chapter 5
Mar. 9, Tues.	Microarray Clustering and Classification	• Mount Readings: p 519-525
Mar. 11, Thurs.	Genetic networks	• KEGG database of genes and gene pathways/networks • EcoCYC database of metabolic pathways in E. Coli • Recent Review of EGF-signal pathway modeling • Example Bayes Net approach to modeling in cell signalling
Mar. 16, Tues.	Protein structure prediction	• Mount Readings: p 427-473 • 3D structure computations, NMR, Xtallography
Mar. 18, Thurs.	Protein structure prediction (cont.)	• Mount Readings: p 427-473 • 3D structure computations, NMR, Xtallography

Mar. 23, Tues.	Project Proposal Presentation	
Mar. 25, Thurs.	Project Proposal Presentation	• **Project Proposal DUE**
SPRING BREAK		
April 6, Tues.	Hidden Markov models	• Mount Readings: p 173-192
April 8, Thurs	Molecular energetic and dynamics	•
April 13, Tues.	Proteomics, 3D motifs	• Mount Readings: pp 496-508
April 15, Thurs	3D structure alignment	• Mount Readings: p 381-427
April 20, Tues.	Natural Language Processing	• Unified Medical Language System • Medical Entity Subject Heading (MESH) Browser • Natural Language Processing papers at PSB meeting 2001 • Natural Language Processing papers at PSB meeting 2002
April 22, Thurs	Microarray Clustering and Classification (cont.)	• Mount Readings: p 519-525
April 27, Tues.	Genetic networks (cont.)	• Pacific Symposium on Biocomputing, session on Gene Networks 1999 • Pacific Symposium on Biocomputing, session on Gene Networks 2000 • Example Bayes Net approach to modeling in cell signalling
April 29, Thurs	Recent Bioinformatics Research	• Asbestos Modeling • Systems Biology
May 4, Tues.	Recent Bioinformatics Research and Final Thoughts	• Asbestos Modeling • Systems Biology
May 6, Thurs.	Guest Lecture	
May 11, Tues.	Final Project Presentation	
May 13, Thurs.	Final Project Presentation	• **Final project documentation DUE**