ANSCI 492 X, BIOCH/BIOPH/PHYSL 490 B

BIOINFORMATICS

SP03 ½ Unit 8 week section

Course Information:

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Classroom lectures:
Monday, Wednesday and Friday, 3:00 pm – 3:50 pm. 166 Wohlers Hall

Course web address: http://webct.cites.uiuc.edu/
Course name: ANSCI 492, Sec X: Bioinformatics
Web page login and password: net id or U of I login and password, respectively
Web Course Tools (Webct) support: http://webct.cites.uiuc.edu/

Prerequisite: Graduate status in ACES, or one of the graduate programs of the School of Molecular and Cellular Biology

Objectives:

Genomic and proteomic projects offer large amounts of complex data that challenge the effective storage, retrieval, analyses and interpretation of the results. Bioinformatics integrates biology and computer science to provide efficient methods to combine and understand the information coming from these projects. Bioinformatics is rapidly expanding in breadth and service and there is a strong demand for researchers skillful in this area.

The course will cover the most critical aspects of Bioinformatics in regular lectures, invited presentations and computer-based demonstrations. During the course:
1) the students will be introduced to a variety of bioinformatic databases and tools
2) the students will understand the relative advantages of multiple bioinformatic resources
3) the students will be familiar with the fundaments behind the bioinformatic resources
4) the students will apply the concepts to individual projects related to their own research or interest.

Topics:

Public Genomic and Proteonomic Databases,
Sequence Alignment and Database Searches,
Biology Workbench,
Dynamic programming and heuristic alignment algorithms,
Scoring matrices,
BLAST, FASTA, CLUSTALW, PSIBLAST,
Hidden Markov Models,
Protein structure and visualization,
Phylogenetic Reconstruction

Grading

Activity	Percentage of grade	Due
Quizzes on invited lectures	10%	
1st Homework	2%	Wednesday 4-2-2003 at 8PM
2nd Homework	15%	Wednesday 4-9-2003 at 8PM
3rd Homework	16%	Wednesday 4-23-2003 at 8PM
4th Homework	17%	Wednesday 5-7-2003 at 8PM
Final project Due 5-13-2003 at 8PM	40%	

Quizzes:
Six invited presentations on state-of-the-art applications of Bioinformatics to exemplary research are scheduled. The presented materials will be evaluated with a quiz at the end of each invited lecture. The 4 quizzes with highest scores (2.5% of the grade per quiz) will count towards the final grade. The invited lectures are currently scheduled for March 21, April 16, April 21, April 30, May 5 and May 7, 2003.

Homeworks and Final Project:
All homework assignments and the final project must be electronically submitted using the course WebCT webpage by the respective deadlines. Email attachment or printed submissions will not be accepted. Only one homework submitted up to 5 weekdays after the deadline will be accepted. This exceptional late submission must be previously arranged with the instructor. Students are responsible to ensure that their work is correctly and successfully submitted and should notify the TA and instructor of any problems in this matter at least 30 minutes before the homework deadline. Students are encouraged to submit their homework assignments at least 30 minutes before the deadline.

Basic outline of homework assignments and final project

The homework assignments and final project will be based on a class of genes to be selected by the student and approved by the instructor. In addition, the homework assignments will include questions based on the materials covered in the lectures and class notes.
The project component of the first homework assignment consists on submitting the identification of a class of genes or associated proteins selected for study.
The project component of the second homework assignment consists on gathering information about the selected class by searching databases by character strings.

The project component of the third homework assignment consists on gathering information about the selected class by searching databases by sequence homology and inferring relationships.
The project component of the fourth homework assignment consists on the study of the secondary and tertiary protein structures associated with the selected class.
The final project consists on integrating the results of the homework assignments and use additional bioinformatic resources into a report. The report must draw conclusions about the class of genes studied and poses questions that could be the basis of future work.

Academic Integrity:

Rule 33 of the Code on Campus Affairs and Handbook of Policies and Regulations Applying to All Students (http://www.uiuc.edu/admin_manual/code/rule_33.html) gives complete details of rules governing integrity for all students. Students are responsible for knowing and abiding by these rules.

Policies on computer resources and copyrights:

All students must adhere to the rules and policies indicated by the software and websites used for course related purposes. The policy on class notes and related materials copyrights follows The General Rules Concerning University Organization and Procedure (University of Illinois Board of Trustees, 1998) and can be found at http://www.vpaa.uillinois.edu/policies/patents.htm.

Recommended reading:
Developing Bioinformatics Computer Skills. C. Gibas and P. Jambeck. 2001. O'Reilly.

Suggested readings:
Introduction to computational biology. Maps, sequences and genomes. M. S. Waterman. 1996. Chapman & Hall.
Genetics Databases. Edited by M. J. Bishop. 1999. Academic Press.
Introduction to Computational Molecular Biology. J. Setubal and J. Meidanis. 1997. PWS Publishing Company.
Bioinformatics. A practical guide to the analysis of genes and proteins. Edited by A. D. Baxevanis and B. F. F. Ouellette. 1998. John Wiley & Sons, Inc.
Genetic data analysis II: methods for discrete population genetic data. B. S. Weir. 1996. Sinauer Associates.
Molecular evolution. Li, W-H. 1997. Sinauer Associates.
Bioinformatics. Pierre Baldi, Soren Brunak, and Sren Brunak. 2001.MIT Press.
Discovering Genomics, Proteomics, and Bioinformatics. A. Malcolm Campbell, and Laurie J. Heyer. 2002. Pearson Education.
Statistical Methods in Bioinformatics: An Introduction. Warren J. Ewens, Gregory R. Grant, and Gregory Grant. 2001. Springer-Verlag New York.
Bioinformatics: Sequence and Genome Analysis. David W. Mount, and David Mount. 2002. Cold Spring Harbor.
Fundamental Concepts of Bioinformatics Dan E. Krane, and Michael L. Raymer. 2002. Pearson Education.
Bioinformatics for Dummies. Jean Claverie, and Cedric Notredame. 2003. Wiley, John & Sons,