CSE3800/BME4800/CSE5800: BIOINFORMATICS
Fall 2008

Lectures: TTh 3:30-4:45pm, UTEB 175

Instructor: Ion Mandoiu
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Textbook: Neil C. Jones and Pavel A. Pevzner, *An Introduction to Bioinformatics Algorithms*, MIT Press, 2004. Textbook website: http://www.bioalgorithms.info/.

Prerequisites: BIOL 1107, CSE 2500, and either STAT 3025Q or STAT 3345Q, or equivalent background in biology, discrete math, and statistics.

Course outline: This course is an introduction to the fundamental mathematical models and algorithmic techniques used in bioinformatics. Emphasis will be placed on modeling computational problems arising in biology as graph-theoretic, statistical, or mathematical optimization problems, and on designing, analyzing, and implementing efficient combinatorial algorithms for the latter. Covered algorithmic techniques will include exhaustive search, integer programming, greedy algorithms, dynamic programming, divide-and-conquer, graph algorithms, combinatorial pattern matching, clustering, hidden Markov models, and randomized algorithms. Biological applications covered will include restriction mapping, DNA sequencing, motif finding, pairwise and multiple sequence alignment, gene prediction, evolutionary trees, and genome rearrangements.

Tentative Schedule:

Week	Lecture dates	Topics	Notes
1	Aug 26 & 28	Intro to molecular biology (Ch. 3), Exhaustive search (Ch. 4)	
2	Sept 2 & 4	Exhaustive search (contd.), Integer programming (handout)	Hw1 out
3	Sept 9 & 11	Greedy algorithms (Ch. 4)	Hw1 due, Prog1 out
4	Sept 16 & 18	Dynamic programming (Ch. 6)	Prog1 due, Hw2 out
5	Sept 23 & 25	Dynamic programming (contd.)	Hw2 due, Hw3 out
6	Sept 30 & Oct 2	Divide and conquer (Ch. 7)	Hw3 due, Prog2 out
7	Oct 7 & 9	Graph algorithms (Ch. 8)	Prog2 due, Hw4 out
8	Oct 14 & 16	Graph algorithms (contd.)	Hw4 due
9	Oct 21 & 23	Pattern matching (Ch. 9)	FP topic due, Hw5 out
10	Oct 28 & 30	Clustering (Ch. 10)	Hw5 due
11	Nov 4 & 6	Phylogenetic trees (Ch. 10)	FP lit. rev. due, Hw6 out
12	Nov 11 & 13	Hidden Markov models (Ch. 11)	HW6 due
13	Nov 18 & 20	Hidden Markov models (contd.)	FP prog.rep. due, Hw7 out
14	Dec 2 & 4	Randomized algorithms (Ch. 12)	Hw7 due

Grading and course policies: Grading will be based on homework assignments (40%), programming assignments (20%), and a final project (40%). Homework will be mostly theoretic in nature and will be assigned bi-weekly. There will be 2 individual programming assignments requiring you to implement complete solutions to specified bioinformatics problems in the programming language of your choice. The final project will give you the opportunity to study a bioinformatics problem in more depth. Suitable final project topics include surveys of bioinformatics topics not covered in the lectures, design and implementation of novel algorithms, and empirical evaluation of existing methods. A list of potential topics will be provided towards the middle of the semester, although you are encouraged to devise your own. You will be required to submit a written

final report of 15-20 pages and give a short presentation of your project at the end of the semester. When appropriate, projects can be done in teams.

HuskyCT: We have a HuskyCT (formerly Vista/WebCT) site for the class; you can access it by logging in with your NetID and password at https://huskyct.uconn.edu/. You must check HuskyCT regularly for class materials, grades, problem clarifications, changes in class schedule, and other class announcements.

Academic honesty: You are expected to adhere to the highest standards of academic honesty. Unless otherwise specified, collaboration on assignments is not allowed. Use of published materials is allowed, but the sources should be explicitly stated in your solutions. Violations will be reviewed and sanctioned according to the University Policy on Academic Integrity.

Students with disabilities: If you have a documented disability for which you are or may be requesting an accommodation, you are encouraged to contact the instructor and the Center for Students with Disabilities or the University Program for College Students with Learning Disabilities as soon as possible to better ensure that such accommodations are implemented in a timely fashion.