CSE3800/BME4800/CSE5800: BIOINFORMATICS
Fall 2012

Lectures: TTh 3:30-4:45pm, ~~MONT 319~~ **OAK 105**

Instructor: Ion Mandoiu
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Office hours: MW 12-1pm or by appointment

Textbook: Neil C. Jones and Pavel A. Pevzner, *An Introduction to Bioinformatics Algorithms*, MIT Press, 2004. Electronic version available at

http://www.netLibrary.com/urlapi.asp?action=summary&v=1&bookid=125977

Prerequisites: BIOL 1107, CSE 1100 or 1010, and either STAT 3025Q or STAT 3345Q.

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 28 & 30	Intro to molecular biology (Ch. 3), Exhaustive search (Ch. 4)	
2	Sept 4 & 6	Exhaustive search (contd.), Integer programming (handout)	Hw1 out
3	Sept 11 & 13	Greedy algorithms (Ch. 5)	Hw1 due, Prog1 out
4	Sept 18 & 20	Dynamic programming (Ch. 6)	Prog1 due, Hw2 out
5	Sept 25 & 27	Dynamic programming (contd.)	Hw2 due, Hw3 out
6	Oct 2 & 4	Divide and conquer (Ch. 7)	Hw3 due, Prog2 out
7	Oct 9 & 11	Graph algorithms (Ch. 8)	Prog2 due, Hw4 out
8	Oct 16 & 18	Graph algorithms (contd.)	Hw4 due, Prog3 out
9	Oct 23 & 25	Pattern matching (Ch. 9)	FP topic due
10	Oct 30 & Nov 1	Pattern matching (contd.)	Prog3 due, Hw5 out
11	Nov 6 & 8	Hidden Markov models (Ch. 11)	FP lit. rev. due
12	Nov 13 & 15	Hidden Markov models (contd.)	Hw5 due, Hw6 out
13	Nov 27 & 29	Clustering and Phylogenetic trees (Ch. 10)	FP prelim. rep. due
14	Dec 4 & 6	Randomized algorithms (Ch. 12)	Hw6 due

Grading: Grading will be based on:

- In-class quizzes (10%)
- Homework assignments (30%)
- Programming assignments (30%)
- Final project (30%)

6-7 unannounced quizzes will be given throughout the semester based on material covered in lectures. Homework will be mostly theoretic in nature and will be assigned bi-weekly. There will be 3 individual programming assignments requiring you to implement complete solutions to specified bioinformatics problems in the programming language of your choice. The final project, typically done in teams of 2-3 students, 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 strongly encouraged to devise your own. You will be required to submit several progress reports and a written final report, and give a short presentation at the end of the semester.

Course policies: There will be no make-ups for missed quizzes or assignments. Late submissions for homework and programming assignments are allowed for up to three days after the original submission deadline, but 10% of the grade will be subtracted for each late day.

HuskyCT: We have a HuskyCT site for the class; you can access it by logging in with your NetID and password at https://lms.uconn.edu/webct/logon/2924211022071. You must check HuskyCT regularly for class materials, problem clarifications, schedule changes, grades, 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.