

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
UNIVERSITY OF NOTRE DAME

CSE 40532/60532: Bioinformatics Computing
Fall 2008 Syllabus

Time and Location: Tuesday & Thursday 2:00-3:15, DeBartolo 125

Instructor:

- Dr. Scott Emrich
 - Office: 351 Fitzpatrick Hall; 631-0353; semrich@nd.edu;
 - Cell: (574) 520-8150; IM: semrichnd; Google: scott.emrich@gmail.com
 - Scheduled office hours: Mon 4:30-6:00, Wed 4:30-6:00, Thurs 3:30-4:30
 - If my office door is open, you are welcome to come in and ask questions.
 - Office visits also can be arranged via email

Teaching Assistant:

- Santanu Chatterjee – Tues 3:30-5:30 pm (in Fitz cluster); email: schatter@cse.nd.edu

Course Webpage: <http://www.cse.nd.edu/courses/cse40532/www/>

Short Course Description:

- Broad overview of bioinformatics with a substantial problem-solving component.

Course Outcomes: At the end of the course, you will be able to answer, “What is bioinformatics?” and “What does computer science really have to offer molecular biologists?” Specifically, you will be able to:

1. Define computational genomics and phylogenetics concepts. Assessed in exams.
2. Apply common bioinformatics tools and techniques effectively. Assessed in exams and assignments.
3. Implement basic algorithms such as sequence alignment. Assessed in exams and programming assignments.
4. Perform independent genome comparisons and assemblies using gained knowledge. Assessed in assignments.
5. Evaluate on your own the promise and challenges for computing of massively parallel sequencing technologies. Assessed in exams.

Prerequisites: CSE 30331 for CSE students, CSE 20232 or equivalent for non-CSE students.

Textbook: Cristianini and Hahn, *Introduction to Computational Genomics*.

Additional material will be made available as needed throughout the semester.

Schedule of Major Topics and Exams:

1. DNA, genes and the genome (8/26)
2. Sequence statistics (8/28; HW#1 out)
3. Sequence alignment (9/2-9/11; HW#1 due 9/9, HW#2 out)
4. Hidden Markov Models (9/16-9/23; HW #2 due 9/23, HW#3 out)
5. *Ab initio* gene finding (9/25)
6. Variation and natural selection (9/30-10/2; HW #3 due 10/2, HW #4 out)
7. Whole genome comparisons (10/7-10/16; **exam in-between**)
8. Midterm exam (10/14 *in class*)
9. Genome sequencing and assembly (10/28-10/30; HW #4 due 10/30, HW #5)
10. Assembly validation (11/4)
11. Phylogenetic analysis (11/6-11/13; HW #5 due 11/13; HW #6)
12. Genome annotation (11/18)
13. Next-generation sequencing (11/20; HW #6 due; HW #7 out)
14. Special topics (11/25-12/9; HW #7 due 12/4)
15. Project presentations (12/11 *in class*)
16. Final exam (12/17 10:30 am – 12:30 pm)

Grading: Maximal points will be awarded for work completed on time; otherwise a small penalty may be assessed (5% per day). Grades will be computed from a weighted sum of points received for each of the following:

- 35%: homework (including programming and written answers placed in dropbox)
- 25%: final project
- 15%: midterm exam (Wednesday, February 27)
- 20%: final exam (Thursday, May 8, 8:00am-10:00pm)
- 5%: class participation

The lowest homework assignment will be dropped when computing final grades. Course percentages will be translated into letter grades as follows: A: 93% and up; A-: 90-93%; B+: 87-90%; B: 83-87%; B-: 80-83%; C+: 77-80%; C: 73-77%; C-: 70-73%; D: 63-70%; F: 0-63%.

Absences will only be excused in accordance with University policy (see *du Lac*).

Project: A final project involving teams of students will be due at the end of the semester. Teams must consist of three to five students (solo projects won't be allowed). Projects will be demonstrated at an end-of-semester pizza party.

ADA statement: Any student who feels they may need an accommodation based on a disability can contact Prof. Emrich privately to discuss their specific needs in addition to contacting the proper office on campus. Full accommodation will be provided as needed.

Academic Code of Honor: When you arrived at Notre Dame you agreed to abide by the Academic Code of Honor. Because any instance of academic dishonesty will be handled as required by University policy, please see Prof. Emrich if you are not sure which actions might constitute a violation of the Code of Honor in this class and/or review *du Lac*. In general, you may study and discuss course-related work with classmates, but answers to graded assignments/programs must be written independently unless otherwise instructed