Time and Location: Tuesday & Thursday 2:00-3:15, Debartolo B011

Instructor:

• Dr. Scott Emrich
  ○ Office: 211B Cushing Hall; 631-0353; semrich@nd.edu;
  ○ Skype: semrichnd; Google: scott.emrich@gmail.com
  ○ Tentative office hours: Mon 2:00-3:00, after class and by appointment
  ○ If my office door is open, you are welcome to come in and ask questions.

Course Webpage: https://www3.nd.edu/~semrich/bc17/

Short Course Description:

• Broad overview of bioinformatics with a substantial problem-solving component.
  Topics include: generative models for sequences, pairwise sequence alignment,
  basic methods in molecular phylogeny and evolution, \textit{ab initio} gene prediction,
  whole genome comparisons, genome assembly and analysis.

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 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.
5. Evaluate on your own the promise and challenges for computing on biological datasets. Assessed in the final project.

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

Textbook: Cristianini and Hahn, \textit{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 (8/22)
2. Sequence statistics (8/24)
3. Sequence alignment (8/31-9/12)
4. Variation and natural selection (9/7)
5. Hidden Markov Models (9/12-9/19)
6. Ab initio gene finding (9/21)
7. Whole genome comparisons (9/26-10/3)
8. Midterm exam (10/5 in class)
9. Genome assembly and validation (10/10-10/24; note spans break)
10. Phylogenetic analysis (10/26-11/2)
11. Special topics (11/7-12/5)
12. Project presentations (12/7 in class)
13. Final exam (TBD)

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

45%: homework (including programming and written answers placed in dropbox)
25%: final project and final exam (if agreed upon)
20%: midterm exam (Thursday, October 5th)
10%: 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 two to four students (solo projects won’t be allowed).

ADA statement: Any student who feels they may need an accommodation based on a disability can contact Prof. Emrich privately for a meeting in his office 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.