Biology 526H: Computational Genetics

Fall 2014

Description
Tools from computer science, applied mathematics, and statistics have become essential for research in genomics, both because of the scale of the data and the complex nature of the research questions. This interdisciplinary seminar provides an introduction to common algorithmic and statistical ideas in the field, rather than providing instructions on the use of specific software packages. The course is aimed at life science students who have an affinity for mathematical puzzles and programming. Seminar-style classes will be complemented by computer labs. The class will give students a rare opportunity to hone their scientific writing and oral presentation skills. The final project will also give students an opportunity for independent research.

4.0 credit hours.

Schedule
- Seminars: Tue & Thu 8:00am-9:15am, meeting through the end of Aug in Phillips 224 and in Wilson 202 thereafter
- Computer Lab: Thu 12:30pm-1:20pm, Wilson 217

Instructors
Instructor: Todd Vision, Department of Biology
phone: 962.4479
email: tjv@bio.unc.edu
office hours: Tue 11:00pm-12:00pm, 1pm-2pm, or by appt, 3155 Genome Sciences

Teaching Assistant: Tom Christy, Curriculum in Bioinformatics and Computational Biology
email: twchrist@email.unc.edu
office hours: TBA

Eligibility and prerequisites
This course is intended for advanced undergraduates and beginning graduate students in the life sciences. Enrollment is limited, and honors undergraduates are given priority. A grade point average of 3.0 is required for all undergraduates.

Prerequisites include BIOL 202, COMP 116 and STOR 155 or their equivalents; alternatively, students must receive permission from the instructor. The courses may be satisfied as corequisites.
While Matlab will be used in the course, no prior experience is assumed. Familiarity with a UNIX-style command line interface will be helpful.

**Reading**


Paperback available from UNC Bookstore. Prices at Amazon:

- Paperback $53.67
- Kindle $40.80
- Hardcover $160.55

Also on 2hr reserve at the Undergrad Library: QH324.2 .B5474 2011

Additional books on reserve at the Undergrad Library (all on 24 hr loan)

- *Bioinformatics : sequence and genome analysis* / David W. Mount. QH441.2 .M68 2004

Additional readings will be made available on Sakai.

**Computer labs**

There are seven computer lab sessions. Each lab introduces a problem set that includes both
computational and pencil-and-paper exercises. The completed problem sets are due the following week at the beginning of the lab period. Late problem sets receive half credit. This can be waived in special cases with sufficient notice.

The computer labs will be based on Matlab. You should obtain Matlab (for Windows, Mac or Linux) from Software Acquisition: http://software.sites.unc.edu/software/matlab. It is free to you due to a UNC site license. The Bioinformatics Toolkit, which we will be using, is included.

**Student topics**

Students will be responsible for presenting a short lesson on a topic of their choosing, pending approval from the instructor. It may be based on material from the textbook or reserved readings that was not covered in class, or it may be based on a computational genetics topic from the literature.

**Journal clubs**

In the final third of the class, the computer lab timeslot will be used for journal clubs, i.e. discussions of primary literature in computational genetics.

**Independent projects**

Students will undertake small independent research projects on a topic of their choosing, pending approval from the instructor. Class times are reserved for students to present their proposals at the beginning of the project and to provide a progress report near the end. The final assignment is a research report written in the style of a journal article, to be submitted by the scheduled time of, and in lieu of, the Final Exam.

**Grading**

- Computer labs/problem sets cumulatively worth 25%
- Two midterms exams cumulatively worth 25%
- Class participation (including presentations, journal clubs) 25%
- Final paper on independent research project 25%

Exams will be closed book.

**Class websites**

- [Sakai](#)
- [Schedule](#)