

BIOL 525L: Analysis and Interpretation of Sequence-based Functional Genomics
Department of Biology, University of North Carolina at Chapel Hill
Spring 2019

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Computer Lab Meeting Time: Tues 3:30-4:20pm, GSB 1378
Final Exam: None
Concurrent enrollment in lecture class required

Description

This computer lab aims to provide students with experience using computational analysis software for genomics applications in a linux environment. The focus will be on applications for analysis of high-throughput sequence data. The labs will be designed to complement topics in the accompanying lecture class and provide more practical instructions on specific genomics resources such as the UCSC Genome Browser. Additional instruction to help complete class assignments will also be provided.

Goals

The goals of this class are to

- (i) provide practical experience using computational biology software, and using web-based tools and resources for the analysis of genomics data;
- (ii) provide understanding strengths and limitations of analysis software.

Prerequisites

This course is intended for upper-level undergraduate and beginning graduate students in life sciences. Basic knowledge of molecular biology, beginning level programming skills, and familiarity with basic statistical concepts are expected, such as those learned in the following UNC classes or their equivalents:

BIOL 202 – Molecular Biology and Genetics
COMP 116 – Introduction to Scientific Programming, COMP 110 – Introduction to Programming, or equivalent
STOR 155 – Introduction to Statistics, or equivalent

Students may also request a waiver from the instructor.

Weekly Topics

Week 1 – no lab

Week 2 (1/15): Becoming familiar with the virtual computing lab (VCL) at UNC, linux operating system

Week 3 (1/22): FastQC – assessing DNA sequence quality

Week 4 (1/29): Aligning short read sequences

Week 5 (2/5): RNA-seq analysis

Week 6 (2/12): Differential RNA-seq analysis

Week 7 (2/19): Pathway enrichment analysis

Week 8 (2/26): Transcription factor binding site (TFBS) peak calling

Week 9 (3/5): Differential ChIP-seq analysis

**** Spring Break (3/11-3/15) ****

Week 10 (3/19): Creating and using a MySQL database

Week 11 (3/26): The UCSC Genome Browser and database

Week 12 (4/2): Motif finding

Week 13 (4/9): micro-RNA analysis

Week 14 (4/16): Chromatin and transcription factor binding

SAKAI

The Sakai system at UNC (<http://sakai.unc.edu>) will be used extensively to provide instructional material, assignments including student submission and grading of assignments.

Grading

Grades for this course will reflect the ability of the student to master practical aspects of computational genomics analysis. This will be assessed through graded computer-based assignments. Late homework assignments will be penalized 10% a day, cumulatively. This means that an assignment three days late will be penalized 30%. Exceptions will be made by prior approval by instructor. Final grades for the lab portion of this course will be based on in-class assignments, and will be factored in with grades from the lecture portion of the course to assign a single combined grade (see syllabus for BIOL525 lecture).

A 10% grading scale will be used, meaning:

| | |
|---|------------|
| A | 90% - 100% |
| B | 80% - 89% |
| C | 70% - 79% |
| D | 60% - 69% |
| F | <60% |

Honor Code

Computational genomic research is, in general, highly collaborative and open. That being said, students need to learn to independently perform the work assigned in this class. Students are encouraged to help classmates understand general concepts and techniques learned in class, even related to homework assignments, but under no circumstances should complete answers, computer code, or the like for homework be shared. Specific questions about individual homework assignments should be discussed with the professor.

University Approved Absences

No right or privilege exists that permits a student to be absent from any class meetings, except for these University Approved Absences:

1. Authorized University activities
2. Disability/religious observance/pregnancy, as required by law and approved by [Accessibility Resources and Service \(ARS\)](#) and/or the [Equal Opportunity and Compliance Office \(EOC\)](#)
3. Significant health condition and/or personal/family emergency as approved by the [Office of the Dean of Students](#), [Gender Violence Service Coordinators](#), and/or the [Equal Opportunity and Compliance Office \(EOC\)](#).

Neither you nor the student are obligated to contact these offices if the information you have received from the student sufficiently meets the standards for a University Approved Absence. Written verification is not required.

Diversity Pledge

The Department of Biology values the perspectives of individuals from all backgrounds reflecting the diversity of our students. We broadly define diversity to include race, gender identity, national origin, ethnicity, religion, social class, age, sexual orientation, political background, and physical and learning ability. We strive to make this classroom and this department an inclusive space for all students.

Syllabus Changes

The professor reserves the right to make changes to the syllabus, including project due dates and test dates. These changes will be announced as early as possible.