

BISC478: Computational Genome Analysis

Spring 2018

Instructor: Prof. Andrew D. Smith

Teaching assistant: Mr. Meng Zhou

Lectures: 9:30AM-10:50AM, T-Th

Discussion sessions: 3:00PM-3:50PM, Tuesdays

This course will provide students with an introduction to genome biology and genomic technology with a strong emphasis on quantitative methods for understanding genomes and genome data. Broadly, this course covers DNA sequencing technology, computational methods to directly complement those technologies, functional genomics, computational methods to extract functional information from genomic data sets, and biomedical applications of genomics. The data analysis techniques covered in this course are founded in computer science as well as probability and statistics. Students will also learn practical data analysis techniques, and practical exercises will be the focus of discussions sessions. Students will be asked to bring laptops to particular lectures in order to work through practical exercises during class.

Schedule of topics:

Week	Date (Tuesday)	Topic
1	January 9	Introduction to molecular sequences
2	January 16	Sequencing technologies
3	January 23	Short-read sequencing and emerging technologies
4	January 30	Genome sequence assembly
5	February 6	Mapping sequenced reads
6	February 13	Single-nucleotide variants and genome-wide association studies
7	February 20	*** Midterm on Thursday February 22 (covering weeks 1-6); review on Tuesday
8	February 27	Pairwise sequence alignment
9	March 6	Multiple sequence alignment
10	March 13	*** Spring Break
11	March 20	Multiple sequence alignment
12	March 27	RNA-seq experiments and basic analysis
13	April 3	Gene expression analysis
14	April 10	Co-expression networks and gene set enrichment
15	April 17	Regulatory sequence analysis and ChIP-seq
16	April 24	Epigenomics

Discussion sessions: The discussion sessions for this course will serve multiple purposes. The topics of the discussions sessions will correspond closely to the lectures. The format of the discussions will vary from week to week. Some will include discussion of particular topics and will require a bit of preparation. Others will involve demonstration of practical data analysis by the TA to supplement practical exercises covered in class. And others will provide an opportunity for you to work on assignments with assistance and feedback from the TA.

Evaluation: Students will be evaluated based on one midterm, worth 30%, one final worth 40%, and 5 assignments, each worth 6%. The assignments will be diverse, some requiring simple programming and most requiring practical data analysis.

Office hours: Fridays (12PM-1:30PM), RRI 408E. Or by appointment, email or phone (O:213-821-4142; C:310-849-8288). Skype sessions are also possible.

Text book: None required. Traditionally this course has used the book "*Computational Genome Analysis*" by Deonier, Tavaré and Waterman. This semester roughly half the content will correspond to particular sections in that book, but the text is not necessary and not sufficient for those topics. This text should be considered supplementary, and using it is not necessary.

Cell/smart-phones: Use not allowed in class except in case of emergency or with prior permission.

Statement for Students with Disabilities: Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.-5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

Statement on Academic Integrity: USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. Scampus, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: <http://www.usc.edu/student-affairs/SJACS/>