BME 3890/8901. Special Topics - Computational Genomics

Instructor:

Maizie Zhou, PhD

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Stevenson 5(Sci & Engr) 919

Teaching Assistant:

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In-person office hours:

Weiman: Wednesday 1:30-2:30pm, Stevenson 5(Sci & Engr) 917 or by appointment.

Class Information:

Class Hours: Tuesday and Thursday   4:15 - 5:30pm

Room: Stevenson 5(Sci & Engr) 312

Office Hours: By appointment (maizie.zhou@vanderbilt.edu)

Grades: Grading will be based on the following elements:

In-class live coding participation, Homework Assignments, Midterm

Final project (writeup and presentation).

Assessment:

• **In class live coding participation 30%**: There will be multiple living coding participation in class.

• **Homework Assignments 20%:** There will be three homework assignments. You are allowed to work in groups on the homework, but you must write up your own solutions in your own words. ASSIGNMENTS ARE DUE AT 11:59 midnight OF THE DUE DATE THROUGH BRIGHTSPACE.

• **Midterm 15%**

• **Paper Presentations 15%:** Original Journal articles on the topics we cover will be assigned to each student. The paper presentation grade will evaluate understanding of the material covered in class, critical evaluation of the article, and ability to communicate scientific findings to peers. Students receive bonus points for active participation in paper discussion.

(*Meet with me one week (Thursday 8pm through Zoom) before the lecture to discuss the paper/slides. Slides are due at noon before the lecture.)

• **Final Project 20%:** Groups of 2-3 students will be allowed to do the designed project. Student proposed topics are also acceptable, but these have to be approved in advance. Each group will do an oral presentation, and the project write up will be in the form of a 5-6 page paper, including an abstract, introduction to the topic, methods, results / figures, and discussion.

• **Participation Bonus 5%:** Students will receive bonus points by answering questions in class/slack. Maximum bonus points account for extra 5%. Each question will account for 0.25%.

*Register an account on ACCRE by choosing this class group "BME3890 Computational Genomics (bme3890)" and finish the ACCRE training courses (intro to Unix, SLURM, and the ACCRE cluster)

All academic work at Vanderbilt is done under the Honor System.

Class Announcements: All students are held responsible for all announcements made in the class and slack.

Course Materials: The course covers current concepts and practices. As such it is not based on a traditional textbook. Instead, it will rely on notes, Power point presentations, and online resources.

Grading Scale

≥ 93 to ≤ 100	≥ 90 to < 93	≥ 87 to < 90	≥ 83 to < 87	≥ 80 to < 83	≥ 77 to < 80	≥ 73 to < 77	≥ 70 to < 73	≥ 67 to < 70	≥ 63 to < 67	≥ 60 to < 63	≥ 0 to < 60
A	A−	B+	B	B−	C+	C	C−	D+	D	D−	F

Mental Health & Wellness

If you are experiencing undue personal and/or academic stress during the semester that may be interfering with your ability to perform academically, Vanderbilt's Student Care Network offers a range of services to assist and support you. I am available to speak with you about stresses related to your work in my course, and I can assist you in connecting with the Student Care Network. The Office of Student Care Coordination (https://www.vanderbilt.edu/carecoordination/) is the central and first point of contact to help students navigate and connect to appropriate resources on and off-campus. The Student Care Network (https://www.vanderbilt.edu/studentcarenetwork/satellite-services/) also offers drop-in services on campus on a regular basis. If you or someone you know needs to speak with a professional counselor immediately, the University Counseling Center (https://www.vanderbilt.edu/ucc/) offers Crisis Care Counseling.

Emergency Evacuation Plan

In the event of a fire or other emergency requiring evacuation, the occupants of this class should leave the building through the exits closest to the classroom. If you need special assistance during an evacuation, please discuss this with me as soon as possible. The class should gather at the kiosk on the Magnolia Courtyard terrace between Stevenson and Jacobs Hall. Vanderbilt University policy forbids reentry to a building in which an alarm has occurred without authorization by Vanderbilt Security.

Syllabus

Date	Day	Week	Class	Details	Homework
Jan-09	Tues	w1	1	Course overview & organization	
Jan-11	Thurs		2	Intro to ACCRE & Slurm	Homework 1 release
Jan-14	Sun				
Jan-16	Tues	w2	3	In-class live coding 1 - ACCRE & Slurm	
Jan-18	Thurs		4	Basics of DNA and High-throughput sequencing technologies	
Jan-21	Sun				Homework 1 due by midnight
Jan-23	Tues	w3	5	Linux tutorial	Homework 2 release
Jan-25	Thurs		6	In-class live coding 2 - Linux	
Jan-28	Sun				
Jan-30	Tues	w4	7	Python tutorial I - Basics	
Feb-01	Thurs		8	Python tutorial I - DNA strings and matching	
Feb-04	Sun				Homework 2 due by midnight
Feb-06	Tues	w5	9	Python tutorial I - DNA strings and matching	
Feb-08	Thurs		10	In-class live coding 3 - Python (DNA strings and matching)	
Feb-11	Sun				
Feb-13	Tues	w6	11	Python tutorial II - Indexing and Mapping	Homework 3 release
Feb-15	Thurs		12	Dynamic programming and edit distance	
Feb-18	Sun				
Feb-20	Tues	w7	13	Dynamic programming and edit distance (live coding 4)	
Feb-22	Thurs		14	Whole Genome Sequencing Analysis, Sequence Alignment/Variant Calling I	
Feb-25	Sun				Homework 3 due

Date	Day	Week	Class	Details	Homework
Feb-27	Tues	w8	15	Midterm	
Feb-29	Thurs		16	Sequence Alignment / Variant Calling II	
Mar-03	Sun				
Mar-05	Tues	w9	17	In-class live coding 5 (pipeline)	
Mar-07	Thurs		18	Paper Discussion 1	Final Project Topic Selection
Mar-10	Sun				
Mar-12	Tues	w10	19	*SPRING BREAK - NO CLASS*	
Mar-14	Thurs		20	*SPRING BREAK - NO CLASS*	
Mar-17	Sun				
Mar-19	Tues	w11	21	Genome Assembly	
Mar-21	Thurs		22	Paper Discussion 2, 3	
Mar-24	Sun				
Mar-26	Tues	w12	23	Haplotype Phasing	
Mar-28	Thurs		24	Paper Discussion 4, 5	
Mar-31	Sun				
Apr-02	Tues	w13	25	Structural Variant Detection	
Apr-04	Thurs		26	Paper Discussion 6, 7	
Apr-07	Sun				
Apr-09	Tues	w14	27	Single cell RNA sequencing	
Apr-11	Thurs		28	Paper Discussion 8, 9	
Apr-14	Sun				
Apr-16	Tues	w15	29	Paper Discussion 10, 11	
Apr-18	**Thurs**				
Apr-21	Sun				
Apr-23	Tues	w16	30	Final project presentations I	
Apr-25	Thurs		31	Final project presentations II	Final project writeup due by midnight