

## **BME 8901-04. Special Topics - Computational Genomics**

### **Instructor:**

Maizie Zhou, PhD

Assistant Professor of Biomedical Engineering, Computer Science and Data Science Institute

Stevenson 5(Sci & Engr) 919

### **Teaching Assistant:**

Weiman Yuan ([weiman.yuan@vanderbilt.edu](mailto:weiman.yuan@vanderbilt.edu))

Manfei Xie ([manfei.xie@vanderbilt.edu](mailto:manfei.xie@vanderbilt.edu))

In-person office hours:

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

Manfei: Thursday 2:30-3:30pm, Stevenson 5(Sci & Engr) 907 or by appointment.

### **Class Information:**

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

Room: Stevenson 5(Sci & Engr) 306

Office Hours: By appointment ([maizie.zhou@vanderbilt.edu](mailto: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 live 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.

\*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	≥ 90	≥ 87	≥ 83	≥ 80	≥ 77	≥ 73	≥ 70	≥ 67	≥ 63	≥ 60	≥ 0
to ≤ 100	to < 93	to < 90	to < 87	to < 83	to < 80	to < 77	to < 73	to < 70	to < 67	to < 63	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
Aug-24	Thurs	w0	0	Course overview & organization	
Aug-27	Sun				
Aug-29	Tues	w1	1	Intro to ACCRE & Slurm	Homework 1 release
Aug-31	Thurs		2	Basics of DNA and High-throughput sequencing technologies	
Sep-3	Sun				
Sept-5	Tues	w2	3	In-class live coding 1 - ACCRE & Slurm	
Sept-7	Thurs		4	Linux tutorial	Homework 2 release
Sept-10	Sun				Homework 1 due by midnight
Sept-12	Tues	w3	5	In-class live coding 2 - Linux	
Sept-14	Thurs		6	Python tutorial I - Basics	
Sept-17	Sun				
Sept-19	Tues	w4	7	Python tutorial I - DNA strings and matching	
Sept-21	Thurs		8	In-class live coding 3 - Python (DNA strings and matching / debugging )	
Sept-24	Sun				Homework 2 due by midnight
Sept-26	Tues	w5	9	Python tutorial II - Indexing and Tries	
Sept-28	Thurs		10	In-class live coding 4 – Python (Indexing and Tries & debugging)	Homework 3 release
Oct-1	Sun				
Oct-3	Tues	w6	11	Debugging checking	
Oct-5	Thurs		12	Dynamic programming and edit distance (In-class live coding 5)	

Date	Day	Week	Class	Details	Homework
Oct-8	Sun				
Oct-10	Tues	w7	13	Whole Genome Sequencing Analysis, Sequence Alignment/Variant Calling I (In-class live coding 6)	
Oct-12	Thurs		14	Midterm	
Oct-15	Sun				Homework 3 due
Oct-17	Tues	w8	15	Sequence Alignment / Variant Calling II	
Oct-19	Thurs			FALL BREAK - NO CLASS	
Oct-22	Sun				
Oct-24	Tues	w9	16	In-class live coding 7 (pipeline)	
Oct-26	Thurs		17	Paper Discussion 1	Final Project Topic Selection
Oct-29	Sun				
Oct-31	Tues	w10	18	Assembly	
Nov-2	Thurs		19	In-class live coding 8 / Paper Discussion 2	
Nov-5	Sun				
Nov-7	Tues	w11	20	Haplotype Phasing	
Nov-9	Thurs		21	Paper Discussion 3, 4	
Nov-12	Sun				
Nov-14	Tues	w12	22	Structural Variant Detection	
Nov-16	Thurs		23	Paper Discussion 5, 6	
Nov-19	Sun				
Nov-21	Tues			THANKSGIVING BREAK – NO CLASS	
Nov-23	Thurs			THANKSGIVING BREAK – NO CLASS	
Nov-26	Sun				
Nov-28	Tues	w13	24	Paper Discussion 7, 8	
<b>Nov-30</b>	<b>Thurs</b>		<b>25</b>		
Dec-3	Sun				
Dec-5	Tues	w14	26	Final project presentations I	
Dec-7	Thurs		27	Final project presentations II	Final project writeup due by midnight