



JOHNS HOPKINS
UNIVERSITY

EN.601.449/EN.601.649 section 01 Syllabus

Computational Genomics: Applied Comparative Genomics

Course Information:

EN.601.449.01/EN.601.649.01: Computational Genomics: Applied
Comparative Genomics
(3 Credits)

- Fall 2024
- EN Computer Science
- Whiting School of Engineering

The goal of this course is to study the leading computational and quantitative approaches for comparing and analyzing genomes starting from raw sequencing data. The course will focus on human genomics and human medical applications, but the techniques will be broadly applicable across the tree of life. The topics will include genome assembly & comparative genomics, variant identification & analysis, gene expression & regulation, personal genome analysis, and cancer genomics. The grading will be based on assignments, a midterm exam, class presentations, and a significant class project. Prerequisites: knowledge of the Unix operating system and programming expertise in a language such as R or Python.

Instructor Information:

Instructor

- Michael Schatz

mschatz@jhu.edu

Course Schedule:

Fall 2024 [Fall 2024]

Term Start Date: Thursday, 1-Aug-2024 **Term End Date:** Friday, 10-Jan-2025

ADD TO CALENDAR

**Location and
Schedule:**

Schedule Detail: [Lecture: 08-26-2024 to 12-06-2024, MW 03:00 PM - 04:15 PM;
Homewood Campus, Hodson 316]
CRN: EN.601.449.01.AE Fall 2024

Online Resources

The following online resources are essential:

- The course web site contains a schedule of topics, class notes, and assignment details:
<https://github.com/schatzlab/appliedgenomics2024>
- Piazza will serve as our discussion site for the course to ask questions of the instructor, TA and fellow students. The course Piazza site at <https://piazza.com/jhu/fall2024/600449600649/home>

Course Goals

Upon successful completion of this course, you should be able to:

1. Understand the theoretical foundations for several of the most important genomic analysis tools
2. Have hands-on experience running several of the most important genomic tools
3. Perform novel research and analysis in computational biology

Course Topics

We will study the leading computational and quantitative approaches for comparing and analyzing genomes starting from raw sequencing data. The course will focus on human genomics and human medical applications, but the techniques will be broadly applicable across the tree of life. The topics will include genome assembly & comparative genomics, variant identification & analysis, gene expression & regulation, personal genome analysis, and cancer genomics. Please see the main course website for a more detailed schedule, which will be updated as the semester progresses

Course Expectations & Grading

Course grades will be based on assignments (typically running and analyzing existing tools and/or analyzing a dataset), an examination, and a class project, according to the

proportions below. Each homework assignment will be assigned a point value; the overall homework assignment grade will be computed as your total points earned divided by the total achieved in the class.

- 30% - Assignments
- 30% - Midterm (In class; See class schedule for dates)
- 40% - Class Project (Final report along with an in-class presentation and preliminary report)

All grades will be distributed via email and recorded on GradeScope. Please keep your own record of your grades so that you will know your standing in the course. Letter grades for the course will be assigned on a standard scale, subject to the instructor's evaluation of your overall class performance. Students are allowed a total of 96 hours to extend the deadline for assignments, but not the class project, without any penalty. No further extensions will be allowed without a doctor's note or a note from the university.

Assignment Logistics

The assignments and projects in this course will require you to execute command line programs, write code in the language of your choice, or carry out a calculation. You must write all code independently unless the assignment specifically states that you can work in groups. Assignments will be submitted via Gradescope.

Attendance

All students are expected to attend all meetings of this course, and actively participate in all course meetings. If you miss a class meeting for any reason, you are responsible for material presented, and it is your responsibility to obtain any missed handouts or other materials. If you will be missing more than 1 class, please contact the instructor to discuss how to best review the missed materials.

Key Dates

See the schedule on the class website for the current schedule

Assignments & Readings

See the schedule on the class website

Course Learning Objectives

Course Learning Outcomes (CLOs):

No Course Learning Outcomes are available for this course.

Policies

Academic Policies:

- Disability Services

Johns Hopkins University values diversity and inclusion. We are committed to providing welcoming, equitable, and accessible educational experiences for all students. Students with disabilities (including those with psychological conditions, medical conditions, and temporary disabilities) can request accommodations for this course by providing an Accommodation Letter issued by Student Disability Services (SDS). Please request accommodations for this course as early as possible to provide time for effective communication and arrangements.

- Mental Health Statement

JHU has several resources to support students. Many students struggle at times with stress, anxiety, and depression. The Counseling Center has many resources available to students:

[Johns Hopkins University Student Well-Being \(jhu.edu\)](https://www.jhu.edu/student-well-being)

In addition, The Johns Hopkins University Behavioral Health Crisis Support Team (BHCST) pairs experienced, compassionate crisis clinicians with specially trained public safety officers on every shift on and around the Homewood campus, seven days a week. The BHCST will provide immediate assistance to those who need it and, just as importantly, link individuals in crisis to ongoing support services in the days and weeks that follow. Call Public Safety, 410-516-5600, and ask for a BHCST clinician.

If you have concerns about a specific student, please contact:

- For [emergencies](#) (threat to self or others): 410-516-4600 or 911
- For on-scene mental health support: BHCST at 410-516-4600
- For undergraduates: Student Outreach & Support at 410-516-7857 or studentoutreach@jhu.edu (undergraduates)
- For KSAS Graduate Students: [Renee Eastwood](#), Assistant Dean for Graduate and Postdoctoral Academic and Student Affairs

- For WSE Graduate Students: [Megan Barrett](#), Assistant Dean for Engineering Student Affairs

- Academic Integrity

The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition.

Report any violations you witness to the instructor. You can also contact:

- For undergraduates: the associate dean of student conduct (or designee) by calling the Office of the Dean of Student Life at 410-516-8208 or via email at studentconduct@jhu.edu
- For KSAS Graduate Students: rseitz5@jh.edu
- For WSE Graduate Students: christinekavanagh@jhu.edu

- Inclusivity

The following statement was provided by the Homewood Council on Inclusive Excellence and is incorporated into all WSE course syllabi.

Johns Hopkins University is committed to creating a classroom environment that values the diversity of experiences and perspectives that all students bring. Everyone here has the right to be treated with dignity and respect. Fostering an inclusive climate is important because research and experience show that students who interact with peers who are different from themselves learn new things and experience tangible educational outcomes. Please participate us in creating a welcoming and vibrant classroom climate. Note that you should expect to be challenged intellectually by the instructor, the TAs, and your peers, and at times this may feel uncomfortable. Indeed, it can be helpful to be pushed sometimes in order to learn and grow. But at no time in this learning process should someone be singled out or treated unequally on the basis of any seen or unseen part of their identity.

If you ever have concerns in this course about harassment, discrimination, or any unequal treatment, or if you seek accommodations or resources, please reach out to your instructor or the TAs who will take your communication seriously and will seek mutually acceptable resolutions and accommodations. Reporting will never impact your course grade. You may also share concerns with the department chair, the Director of Undergraduate Studies ([WSE Department Heads and DUSes](#)), the WSE Associate Dean of Outreach and Belonging (Darlene Saporu, dsaporu@jhu.edu), the KSAS Assistant Dean for Diversity and Inclusion (Araceli Frias, afrias3@jhu.edu) or the Office of Institutional Equity (oie@jhu.edu).

In handling reports, people will protect your privacy as much as possible, but faculty and staff are required to officially report information for some cases (e.g., sexual harassment).