

Cancer is a notoriously heterogeneous disease, and individuals with the same cancer type may have vastly different mutations, patterns of gene expression and regulation, and tumor environments. **How can we tell what drives cancer progression?** Publicly-available datasets provide an opportunity to computationally analyze biological measurements from hundreds to thousands of cancer samples. We will learn about state-of-the-art computational methods used to analyze high-throughput cancer datasets by reading and discussing primary literature.

Professor	Anna Ritz (aritz@reed.edu)
Time & Place	Wed 6:10pm-8:00pm online (see Moodle for Zoom link)
Moodle	https://moodle.reed.edu/course/view.php?id=3555
Website	http://reed.edu/biology/courses/bio431/compcancerbio
Office Hours	Mon 3-4pm and Th 10-11am online (see Moodle for Zoom link)

Course Goals: At the end of this course, students will be able to:

1. Understand the breadth of cancer biology research presented in review articles.
2. Critically read current primary scientific literature in the field of cancer biology and computational applications.
3. Identify and summarize the main steps of computational methods from a scientific article.
4. Participate in and lead a discussion around a specific scientific finding or set of findings.
5. Investigate a claim or story about cancer biology by identifying appropriate and reliable references.

Course Structure: The class will read and discuss review papers and technical, primary literature. We will center our focus on pan-cancer analysis of whole genomes, which appeared in a special collection in *Nature* in early 2020 (<https://www.nature.com/collections/afdejfafdb>). Students will engage with the material in three ways:

1. **Discussion Participant.** Students who are not leading discussion will complete a short form about the paper and participate in discussion.
 - 20% Short forms are completed before seminar.
 - 20% Participation in seminar discussions.
2. **Discussion Leader.** Pairs of students will lead two discussions about technical papers.
 - 20% Discussion materials (outline, slides, etc.), submitted before seminar.
 - 10% Leading discussion & answering questions.
3. **Cancer in the News.** Students will have a semester long writing assignment to investigate a recent claim or story about cancer biology and emerging technologies.
 - 5% Mid-term milestone of story selection & initial sources.
 - 25% Written essay on the story, contextualized by primary literature sources.

Further details about each piece will be posted to the Moodle at the beginning of the semester. To summarize, the course consists of discussing material (40%), prepping and leading discussion (30%), and the semester-long assignment (30%). Check in with Anna at any point to talk about your performance in the course.

Schedule. This schedule may shift throughout the semester. See Moodle and/or the class website for more details.

Week 1	W 1/27	Hallmarks of Cancer
Week 2	W 2/03	Class-Based Close Read
Week 3	W 2/10	Group Discussion
Week 4	W 2/17	Group Discussion
Week 5	W 2/24	Group Discussion
Week 6	W 3/03	Cancer in the News Milestone
Week 7	W 3/10	No Class (Mid-term Break)
Week 8	W 3/17	Group Discussion
Week 9	W 3/24	Group Discussion
Week 10	W 3/31	Group Discussion
Week 11	W 4/07	Cancer in the News Milestone
	W 04/14	No Class (Spring Break)
Week 12	W 4/21	TBD
Week 13	W 4/28	TBD

Seminar Attendance. As a seminar-style course, one of the most valuable aspects of Bio431 is the group discussions. Seminars are an opportunity for *everyone* to ask questions (even discussion leaders!). Students will gain a deeper understanding of the material after discussion in seminar.

What's the Policy? If you miss a seminar, email Anna to let her know. You will write a 2-3 page summary of the paper that was discussed. This summary should address

1. What's the overall goal or the biological question?
2. What are the main steps of the method? Describe the parts that you can, and provide questions where you are unclear.
3. What are the results? How does this address the biological question?
4. Are there any limitations to this approach?

Missing Multiple Seminars and/or the Seminars you Lead. There may be a situation where you must miss multiple seminars. If you were set to lead discussion and you must miss, email Anna and your partner to strategize.

Late Policies. You will learn the most in seminar if you prepare for each class by carefully reading the assigned papers and preparing for discussion. The short forms, in particular, are important to complete so your questions can be considered by the discussion leaders.

What's the Policy? Short forms will be marked as on time, late, or missing. All summaries are due the last day of class (April 28th). There is no penalty for the deadlines related to the Cancer in the News assignment (all work must be submitted by finals week).

The Honor Principle is in effect at all times. In a discussion-based course, it is important to be considerate of others, especially in this remote learning environment. If you usually talk a lot, pause and give time for others to process material. If you are usually quiet, practice asking questions and getting involved in the discussion. Be sure to acknowledge the proper people for their work, including mentioning your classmates, citing references in the written assignments, and acknowledging related work while leading discussion.

Academic Accommodations. Please discuss any documented accommodations with me. In the world of remote-learning, please let me know if there are useful supplements to course content (e.g. recording lectures, sharing screens, etc). Disability Accommodation Notification Letters can be obtained from Disability & Accessibility Resources (<https://www.reed.edu/disability-resources/>). All discussions will remain confidential.

Diversity and Inclusion. Bio431 is a combination of biology and computer science, and each field has been claimed to be free of racism and prejudice. This is simply not true. Historically, biological discoveries and advances in computer science have been dominated by privileged voices, namely those of white men. Computational biology, while more recent of a field, also lacks diversity along many important axes (including race, gender, nationality, class, sexuality, religion, ability, etc.). To foster an inclusive learning environment:

- I acknowledge the bias in course materials that stem from systemic privilege, and I aim to make Bio431 content more inclusive each time I teach the course.
- I want to make transparent the fact that learning about computational methods from primary literature is often dense and challenging, no matter your major.
- Many students will have personal circumstances that may affect their performance in the course. I will work with students to make adjustments to the course schedule as needed, and students should be encouraged to seek guidance on any anticipated or realized issues.
- Mental and physical health is more important than attending all parts of class. If you miss multiple days of class, I will reach out to make sure you are okay.

Feedback for the Instructor. Please give me feedback on anything in the syllabus or course, especially with respect to making Bio431 an inclusive learning environment. Let me know if anything makes you uncomfortable in class, if you would like more instruction on a topic, or if you are experiencing a hardship outside of class. Further, note that I (and many faculty) are obligated reporters, who must report possible violations of the Title IX and/or DHSM policies, which govern discrimination and harassment on the basis of sex, gender, and gender identity. If you need additional support, please reach out to Assistant Dean for Student Support Britt Hoover at hooverb@reed.edu or careteam@reed.edu.