

BIOI 494: Bioinformatics Research Design Fall 2018

Number of Credits: 1

Meeting Schedule: Wednesdays, 1:15 – 2:30 , LSB 412

Faculty: Heather Wheeler

Faculty Contact Information: LSB 324; hwheeler1@luc.edu **Office hours:** By appointment

Prerequisite/Corequisite: Bioinformatics BS/MS or MS thesis option

Course Description: This course will focus on the experimental design process of bioinformatics research leading to the development of a research proposal. While the questions addressed in bioinformatics research vary, the unifying thread is data. Data is essential to any bioinformatics research. Students will be introduced to resources for bioinformatics research. This includes bioinformatics literature, reference management tools, online research forums, bioinformatics data repositories, and code version control tools. Best practices and ethical issues in data collection and management will be discussed.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- Describe and implement experimental design practices in bioinformatics
- Use bioinformatics data repositories and code version control tools
- Understand ‘good practices’ in bioinformatics research

Required course materials: Literature readings and online resources will serve as our “textbook”. Literature and links will be available through Sakai.

Course Evaluation Expectation: It is a professional expectation that all students participate in course evaluations to guide ongoing program improvement.

Students with Disabilities: Students seeking academic accommodations for a disability must meet with Services for Students with Disabilities (SSWD) to verify the disability and to establish eligibility for accommodations. Students may visit SSWD in Sullivan Center - Suite 117, call 773-508-3700, email SSWD@luc.edu or visit <https://luc.edu/sswd/> to begin the process. Students should schedule an appointment with their instructor to discuss any academic concerns and/or accommodations. Students are encouraged to contact SSWD as early in the semester as possible.

Academic integrity statement: Academic honesty is an expression of an ethic of interpersonal justice, responsibility and care applicable to Loyola University faculty, students and staff, which demands that the pursuit of knowledge in the university community be carried out with sincerity and integrity. While you are encouraged to interact with fellow students and use outside resources (the web, journal papers, etc.), **your assignments are to be a reflection of your own work.** Referenced resources must be properly credited. Plagiarism and cheating will not be tolerated (read the university policy at http://www.luc.edu/academics/catalog/undergrad/reg_academicintegrity.shtml) and will be reported to the college.

Grading (100 pts available)

Research Proposal: 55 pts total. As you embark on bioinformatics research, the first step is developing a clear direction for your research. This effort should be in collaboration with your research mentor. As our course will focus on research design methods, your research proposal will provide you with the opportunity to put the experimental design practices discussed in this class into practice, while considering requirements for data management and dissemination. Your research proposal should present an original research topic that you would like to pursue in graduate school. In 2 full pages (single spaced, 12 pt. Times New Roman font, 1 inch margins) describe the research idea, your general approach, and resources needed for accomplishing the research goal. Include important literature citations as well as a statement about how your research will contribute to the scientific community. Your grade will be determined as follows:

- **Research Proposal Draft 1: 15 pts.** Your first research proposal draft (1-2 pages) should have your hypothesis framed and background information clearly presented. The experimental protocol should be outlined. Feedback will be given and discussed with each student individually through a one-on-one meeting during class time in Week 4.
- **Research Proposal Draft 2: 15 pts.** Your second research proposal draft should include revisions in response to feedback from Draft 1 and include a fully formed research hypothesis, background information, and experimental protocol. Feedback will be given and discussed with each student individually through a one-on-one meeting during class time in Week 7. (Note, this draft deadline is before the NSF GRFP deadline; your research proposal requirements mirror the NSF requirements here: <https://www.nsf.gov/pubs/2018/nsf18573/nsf18573.htm>. You are encouraged to apply if eligible, but not required.)
- **Research Proposal Draft 3** is optional (no pts) if you would like feedback in Week 15.
- **Final Research Proposal: 25 pts.** Your final draft should include prior feedback and be ready for presentation to your committee and the graduate school.

Data Repository/Tool Presentation: 15 pts. Each student will be responsible for a 20-25 minute 'crash course' in a frequently used tool to facilitate bioinformatics research. Students will give an introduction to the tool followed by a short tutorial on how to use the tool. Both the introduction and tutorial should be prepared using PowerPoint/Google/Adobe slides. Consider yourself the expert on this repository/tool. Each student will be graded using the following criteria:

- 7 pts: Content. Basic functionalities and utilities are presented.
- 5 pts: Clarity. Material is presented clearly on slides and by the presenter.
- 3 pts: Ability to answer appropriate questions from the audience.

Research Blogs: 15 pts total (3 pts each). Approximately every other week blogs will be checked. You will be required to blog via Sakai, outlining your progress and your goals. Include in your blog specifics to your research, parameters used, papers referenced. This is your lab notebook... just electronic. Blogs will only be visible by the instructor and graded for completion. The purpose of this blog is to get you in the habit of routinely recording your work.

Bioinformatics Ethics Report: 10 pts. Each student will select a topic of ethical concern for the field. This does not necessarily have to be pure bioinformatics but a topic that is tied to the field is appropriate.

You will write a 1 page, single-spaced (12 pt font) report on this issue. This is not an opinion paper, rather you will provide a description of the ethical concern and cite relevant resources (e.g. scientific reporting, opinion pieces in the press, etc.). The style of this report should be similar to, e.g., *Science News*. Assume your audience is an educated non-scientist. We will discuss your report topics in class in Week 14.

Participation in Course Discussions: 5 pts. Most weeks we will discuss required readings or material presented in class. Excessive absences and/or lack of active participation when present will result in lost points.

The minimum points (pts) needed for each grade are listed in the table below.

A ≥ 93 pts	B+ ≥ 87 pts	B- ≥ 80pts	C ≥ 73pts	D+ ≥ 67pts	D- ≥ 60pts
A- ≥ 90 pts	B ≥ 83 pts	C+ ≥ 77pts	C- ≥ 70pts	D ≥ 63pts	F < 60pts

Late/Missed Assignment: ALL ASSIGNMENTS/FILES ARE DUE ON THE DUE DATE at 10:00AM. Assignments submitted after this time will not be accepted.

SYLLABUS

Week	Date	Topic	DUE by 10:00 AM via Sakai
1	Aug 29	Introduction to Research Proposals	
2	Sept 5	Lab Notebook and Version Control – discuss reading	
3	Sept 12	Scientific Writing Tips	Blog
4	Sept 19	Individual Meetings Reviewing Drafts	Draft 1
5	Sept 26	Critical Proposal Review – discuss example proposals	
6	Oct 3	Data Management and Reproducible Research – discuss reading	Blog
7	Oct 10	Individual Meetings Reviewing Drafts	Draft 2
8	Oct 17	<i>No class</i>	(GRFP DUE Monday, Oct 22 to NSF)
9	Oct 24	Tools for Collaborative Research – discuss reading (pick presentation topics/dates)	Blog
10	Oct 31	Data Repository/Tool Presentation	
11	Nov 7	<i>No class</i>	Blog
12	Nov 14	Data Repository/Tool Presentation	
13	Nov 21	<i>No class: Thanksgiving Break</i>	
14	Nov 28	Ethical Issues in Bioinformatics Research – discuss reports	Ethics Report and Blog
15	Dec 5	Individual Meetings Reviewing Drafts	Draft 3 (optional for feedback)
16		<i>No class: Finals Week</i>	Final Proposal DUE Dec 13

This syllabus is subject to change at the instructor's discretion.