UC San Diego

BIMM 143: Bioinformatics Syllabus

"Bill and I often have a fun debate about: If you could live anywhere in the world, where would you want to live? We also say: If you were entering any field now and you had your choice, what field would you go in? He and I both would go into the intersection of biology and computer science. When it comes to that field, we are only at the beginning."

- *Melinda Gates*

Welcome to the Course

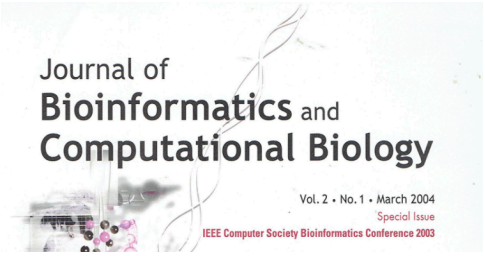
Course Information

Course Description	*This course is about how to harness the power of computation to unlock the secrets of biology. We will cover fundamental computer science concepts and then apply those to 2 bioinformatics projects throughout the quarter. The course is project-based and will also require you to work in a team (or POD if you will). You will also get access to DataCamp, where you will get hands on practice with coding in either python or R.*
Credits	*4 credit hours*
Instructor	*Jamie Schiffer*
IA/TA	*Ugbad Farah & Kritin Karkare*

Course Learning Outcomes

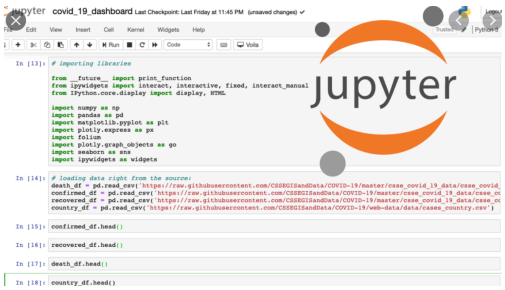
Upon completion of this course, you will be able to:

1. Create a video describing an example of how bioinformatics methods are useful for any application of interest (human health, agriculture, drug discovery, technology's impact on human health, etc.), and show an example of how this method works.



2. Examine and critique key literature in the field of bioinformatics .

3. Construct and present a Jupyter notebook that is capable of querying a bioinformatics database, cleaning and analyzing the data from that database, and displaying the data in a way that classmates can interpret and that answers a scientific hypothesis.



Course Format

The format of the course is entirely online. Students are expected to attend the first lectures of the quarter (the only "required" synchronous lecture), meet with your POD, and engage in learning activities online. There will be optional synchronous lectures throughout the quarter that will cover key concepts in bioinformatics coding & project reviews. This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com.

Find our class page at: https://piazza.com/ucsd/spring2021/bimm143b/home

Synchronous Online Lectures:

Join Zoom Meeting: https://ucsd.zoom.us/j/92939441833

Asynchronous (Online) Course Elements: (see below)

Where can you find the course: Canvas

Assignments, Projects, and Grading

The course is out of a total of 1000 points. Below is the breakdown:

- **Video Lectures & Assignments** – 250 points

Each week there will be video lectures with accompanying assignments. There will be a total of 400 points of video lectures available, but you only need to get to 250 points for full credit.

- **DataCamp & POD Coding/Trivia** – 250 points

For weeks 2-5 you will need to complete coding courses in DataCamp in R or python 25 points/course. For a total of 50 points of EC you can do the other track & additional courses for 10 pts per course. For 150 pts, you will work with your POD on a challenge problem each week OR attend trivia/discussion sections (6x per quarter).

- **Project 1** – 250 points

Create a video about a scientific journal article and code that executes a specific bioinformatics method.

- **Project 2** – 250 points

Come up with a scientific question & hypothesis, that you can answer with a bioinformatics method, and write a jupyter or R notebook describing your project.

This Course Week by Week

Each week you will have part of a project due, you will need to complete coding assignments in either Python or R, and you will need either complete a challenge problem with your POD or attend Bioinformatics trivia. For *extra credit*, you can earn an extra 50 pts to your final grade if you complete both the Python Coding work and R Coding work.

Week	Python Coding Work Due	R Coding Work Due	Project Work Due (Friday @12PM)
1	Install Anaconda Navigator	Install R Studio	
2	Introduction to Python	Introduction to R	**Project 1A**: Choose an example from scientific media coverage of how bioinformatics has been used to understand any real-world phenomenon. (20 pts)
3	Intermediate Python (4 hours)	Intermediate R (4 hours)	**Project 1B:** Outline the video and choose which bioinformatics method you are going to demo. Present this plan to your group and get feedback. (30 pts)
4	Python Data Scientist Toolbox Part 1	Introduction to Bioconductor in R (4 hours)	**Project 1C:** Draft 1 of video and feedback from your pod (50 pts)

5	Python Data Scientist Toolbox Part 2	Introduction to Data Visualization with ggplot2 (4 hours)	**Project 1D:** Final Video due (150 pts)
6	Python Programming Assessment	R Programming Assessment	**Project 2A:** Draft 1 of your scientific hypothesis that is something that can be researched with bioinformatics tools. (20 pts)
7			**Project 2B:** Upload your refined hypothesis and the source where you are going to pull data in from for your final project. (30 pts)
8			**Project 2C:** Draft 1 of your Jupyter notebook – Get feedback from a peer in the course. (25 pts)
9			**Project 2D:** Draft 2 of your Jupyter notebook – Feedback from TA/IA (25 pts))
10			**Project 2E:** Final Draft of your jupyter notebook (presented to the professor & your pod). Upload to github and create your github page (150 pts)

1. Please read UC San Diego's Policy on Integrity of Scholarship and take the integrity pledge!

Course Materials and Tools

In this course, you will need to install Anaconda Navigator or R Studio on your computer.

What is Anaconda Navigator you ask? Here is what they say on their website:
Anaconda Navigator is a desktop graphical user interface (GUI) included in Anaconda® distribution that allows you to launch applications and easily manage conda packages, environments, and channels without using command-line commands. Navigator can search for packages on Anaconda.org or in a local Anaconda Repository. It is available for Windows, macOS, and Linux.

What is R Studio you ask? Here is what they say on their website:
An integrated development environment for R and Python, with a console, syntax-highlighting editor that supports direct code execution, and tools for plotting, history, debugging and workspace management.

We will spend the first week of the course getting you prepared to use Anaconda Navigator or R studio on your computer.

Grading Procedure and Feedback

You all will be graded on an absolute scale. If everyone earns an A, we will be thrilled. Here is how many points account for different grades in this course

A+	*>1000*	*B-*	*795 – 824*
A	*925 – 1000*	*C+*	*765 – 794*
A-	*895 – 924*	*C*	*725 – 764*
B+	*865 – 894*	*C-*	*500 – 724*
B	*825 – 864*	*D*	*< 500*

***Entrance survey** is due April 2nd, PERIOD. This survey is going to be used to put you into your PODs and so it is critical that you finish it in the first week*

***Introductory Videos** can be completed anytime throughout the course, though it is highly recommended that you complete them in the first week. These are not long videos, or difficult to understand, and if you complete them you earn 30 pts to your grade.*

*Your **coding assignments** will not be due technically until the end of the quarter, but the earlier you do the coding assignments the easier the projects will be. I would recommend trying to keep up with the coding assignments each week so that you are not scrambling at the end of the quarter.*

***Project 1D** is due at 12 PM. Every week it is late, a total of 5 pts will be taken off of the final score (out of 100 pts).*

***Project 2E** is due at 12 PM. Every week it is late, a total of 5 pts will be taken off of the final score (out of 100 pts).*

***Exit survey** is due March 12th. If you choose not to do it you will not earn an easy 5 points.*
You can expect feedback & grade on each scaffold of your project a week after it's due date.

Attendance and Participation

Weekly participation in discussion sections and/or your POD meetings is how your attendance will be measured. You can make up discussion section absences by attending two discussion sections the following week, or by attending an office-hours with your POD, or by submitting notes from POD meeting, or by submitting screen shots of POD chats. You have a lot of options here.

Instructional Team: Who Are My Instructors?

Instructor

Jamie Schiffer A computational chemist that works in the pharmaceutical industry. Before joining Pharma, she worked for Schrödinger, where she designed and created an online course in computational chemistry software. Her PhD thesis was focused on long-timescale dynamics of proteins and the role of protein motions on their function and ligand-binding. She has expertise in python, machine learning, virtual screening, and molecular dynamics.

Virtual Office Hours: Every Wednesday at 8 AM
Discussion section: Every Wednesday at 7 PM
Email: jmschiffer@ucsd.edu

Teaching Philosophy

I believe that online education can democratize learning for people of all socioeconomic and cultural backgrounds. While it requires instructors to be creative, online education opens up a world of possibilities for what students can achieve if they are given support and community.

Teaching Assistants

Ugbad Farah

Ugbad is a first year PhD student in Biological Sciences. She graduated from Cal State LA in 2020 with her Master's in Environmental Science and Sacramento State in 2017 with a B.S. in Biochemistry. Her current research interests include studying eco-evolutionary dynamics and issues related to sustainability

Operating System: PC
Coding Language of Choice: R
Discussion Section: Wed 10:30 – 11:30 AM
Virtual Office Hours:

Kritin Karkare

Kritin graduated from UCSD in 2019 with his B.S. in Bioengineering: Bioinformatics and minors in Cognitive Science and Japanese Studies. indeed, he's taking his love for Pokemon even higher this quarter by attempting to memorize all 898 in order (help! - he says - save me!). Alas, he decided to postpone his goal of becoming a Pokemon Master in order to help the Biology Teaching Labs as a staff member, and is on temporary assignment to TA for BIMM 143 and help with upkeep for the Akbari Lab. In the future, he plans to pursue a Ph.D in bioinformatics. On the side, Kritin likes to do science writing and arrange music for the Intermission Orchestra at UCSD.

Operationg System: Windows
Coding Language of Choice: Python or R
Discussion Section: Fri 10:30 – 11:30 AM
Virtual Office Hours: TBD

Resources for Support and Learning

There are a variety of resources available to students at UC San Diego, if you need help in any capacity during this difficult time, please reach out to any of the references below.

Support for Well-being and Inclusion	
Basic Needs at UCSD *Any student who has difficulty accessing sufficient food to eat every day, or who lacks a safe and stable place to live is encouraged to contact:* foodpantry@.ucsd.edu | basicneeds@ucsd.edu | (858) 246-2632 **Counseling and Psychological Services** *Confidential counseling and consultations for psychiatric service and mental health programming* **Triton Concern Line** *Report students of concern:* (858) 246-1111 **Office for Students with Disabilities (OSD)** *Supports students with disabilities and accessibility across campus*	**Community and Resource Centers** **Office of Equity, Diversity, and Inclusion** *As part of the Office of Equity, Diversity, and Inclusion the campus community centers provide programs and resources for students and contribute toward the evolution of a socially just campus* (858).822-.3542 | diversity@ucsd.edu **Get Involved** *Student organizations, clubs, service opportunities, and many other ways to connect with others on campus* **Undocumented Student Services** *Programs and services are designed to help students overcome obstacles that arise from their immigration status and support them through personal and academic excellence*

Campus and Course Policies

Course Policies

Health and Well-Being Statement

All students are deserving of a non-threatening and supportive classroom environment.

Subject to Change Policy

Information in the syllabus is subject to change should it improve the student experience and aid in student learning throughout the quarter.

Letter of Recommendation Policy

I am happy to write letters of recommendation for students that pass my courses. Please give me at least a month lead-time, and provide me with a CV or resume along with some bullet points about why you are interested in the position.

Campus Policies

Please see the below UC San Diego policies and statements:

- **UC San Diego Principles of Community**
- **UC San Diego Policy on Integrity of Scholarship**
- **Religious Accommodation**
- **Nondiscrimination and Harassment**
- **UC San Diego Student Conduct Code**