03-701: Practical Computing for Biologists

Fall 2025

Instructor: En Cai

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Class time: Mondays and Fridays, 11:00-12:20 pm, SH 236

Recitation time: Wednesdays, 5:00 – 6:20 pm, MM 103

Textbook:

Computing Skills for Biologists, by Stefano Allesina and Madlen Wilmes

Course objectives:

In the biological sciences, researchers often encounter diverse data types, such as sequencing data, quantitative datasets, and complex imaging data. Drawing meaningful conclusions from such data requires not only the right analytical tools but also the skills to apply them effectively. This course is designed to equip biology students with practical data analysis skills for biological research, with a focus on accessibility for those with little or no prior coding experience. Topics will include

- Basics of the command-line interface
- Basic programming in Python and R
- Installing and using public software

This introductory course is designed to familiarize students with multiple tools and platforms, offering broad exposure rather than mastery of any single platform.

Coursework: Students will be graded on three components:

1. Participation (25%) – Students are required to participate in the class which will account for 25% of their final grade.
2. Homework (50%) – Students are required to complete weekly homework and turn in their homework on time. This will account for 50% of their final grade.
3. Final project (25%) -- Students are required to complete a final project at the end of the course. This will account for 25% of their final grade.

Policies

Absences: Students are required to attend class, and this accounts for 25% of their final

grade. One excused absence is provided by default. Additional absences can be excused for extenuating circumstances. Absences for religious observances must be submitted by email to the instructor during the first two weeks of the course.

Academic integrity: Study groups can be helpful in understanding course material, but students are responsible for preparing their own assignments independently. All material turned in must be done independently unless explicitly indicated on the assignment handout. The University Policy on Academic Integrity can be found here: http://www.cmu.edu/policies/student-and-student-life/academic-integrity.html.

Homework: Homework will be assigned every week and will be submitted online. One late homework is allowed (you can submit one assignment up to 5 days late). Additional late submissions will incur the following grade penalties:
Submitted within 48 hours of the deadline - 10% reduction in the homework assignment grade.
Submitted 2-5 days after the deadline - 50% reduction in the homework assignment grade.
Submitted more than 5 days after the deadline will receive a zero grade.

Use of AI-assistance: Given the goals of this course, AI tools (such as Chat-GPT, etc.) should NOT be used to generate answers or code for assignments. However, you may use AI tools to support your learning of coding concepts -- for example, to suggest functions, algorithms, or to help debug your code. If you use an AI tool in this way, please include comments in your code to indicate which portions of code is AI-assisted.

Schedule (subject to change):

Date	Topic	Reference	Practices	Assignments
M 08/25	Intro to bash	CSB Ch1.1 – 1.6	W 08/27	
F 08/29	Bash (cont.)	CSB Ch1.6-1.9	W 09/03	Homework 1
M 09/01	NO CLASS	NO CLASS		
F 09/05	Python Basics 1	CSB Ch3.1 – 3.6	W 09/10	Homework 2
M 09/08	Python Basics 2	CSB Ch3.7, Ch 4		
F 09/12	Scientific Python 1	CSB Ch6.1 – 6.3	W 09/17	Homework 3
M 09/15	Scientific Python 2	CSB Ch6.4-6.5		
F 09/19	Regular Expressions	CSB Ch5	W 09/24	Homework 4
M 09/22	Version Control	CSB Ch2		
F 09/26	File formats, public data and software	Supplemental material	W 10/01	Homework 5
M 09/29	Final Project Planning	N/A		
F 10/03	R Basics 1	CSB Ch8.1-8.12	W 10/08	Homework 5 Due
M 10/06	R Basics 2	CSB Ch8.18-8.21		
F 10/10	Final Project Due	N/A	N/A	Projects due 10 pm

Diversity and Inclusion: At Carnegie Mellon University, students, faculty, staff, and researchers come from diverse backgrounds. Students from diverse backgrounds and

perspectives should be able to benefit from this course. In order to maintain our diversity, we must not discriminate against others because of their personal identities. In the event that you suspect there has been a bias based on an individual's identity, you can contact me or the Center for Student Diversity and Inclusion at csdi@andrew.cmu.edu, (412) 268-2150.

Support and Resources for Dealing with Stress:

Take care of yourself. Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress.

All of us benefit from support during times of struggle. You are not alone. There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful.

If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. Counseling and Psychological Services (CaPS) is here to help: call 412-268-2922 and visit their website at http://www.cmu.edu/counseling/. Consider reaching out to a friend, faculty or family member you trust for help getting connected to the support that can help.

If you or someone you know is feeling suicidal or in danger of self-harm, call someone immediately, day or night:

CaPS: 412-268-2922

Re:solve Crisis Network: 888-796-8226

If the situation is life threatening, call the police:

On campus: CMU Police: 412-268-2323

Off campus: 911

If you have questions about this or your coursework, please let us know.