

Instructor Information

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Course Objectives

This course will equip students with a solid foundation in python programming fundamentals such that they may manipulate and create programmed experiments on datasets within the bioinformatics domain. Students will learn commonly used python libraries, modern coding environments, scientific computing environments and version control. Mathematical and statistical principles relevant to biomedical data science will be reviewed through programming and examples and assignments.

Learning Objectives:

1. To understand programming procedural and object-oriented concepts.
2. To learn python commands and widely used platforms.
3. To practice algorithmic thinking for solving mathematical, statistical, and biomedical problems in python.
4. To apply python commands in real-life applications.

Required Materials

Materials and Media:

The course materials will be a series of Jupyter notebooks and video lectures, as well as attached reading made available via Canvas modules. Students are expected to watch the provided lectures and carefully read through the provided materials.

Textbooks:

Suggested:

- Python Data Science Handbook: Essential Tools for Working with Data:

- <https://www.amazon.com/Python-Data-Science-Handbook-Essential/dp/1491912057/>.
- Available in library:
https://na02.alma.exlibrisgroup.com/view/uresolver/01UTAH_INST/openurl?ctx_ver=Z39.88-2004&ctx_enc=info:ofi/enc:UTF-8&ctx_tim=2022-08-03T12%3A13%3A59IST&url_ver=Z39.88-2004&url_ctx_fmt=info:ofi/fmt:kev:mtx:ctx&rft_id=info:sid/primo.exlibrisgroup.com:primo3-Article-proquest_askew&rft_val_fmt=info:ofi/fmt:kev:mtx:book&rft.genre=book&rft.btitle=Python%20Data%20Science%20Handbook&rft.au=VanderPlas,%20Jake&rft.date=2016&rft.isbn=1491912057&rft.isbn_list=9781491912058&rft_id=info:doi/&svc_val_fmt=info:ofi/fmt:kev:mtx:sch_svc&svc.fulltext=yes&rft.eisbn=9781491912140&rft.eisbn_list=1491912146&rft.eisbn_list=1491912138&rft.eisbn_list=9781491912133&rft_dat=%3Cproquest_askew%3EEBC4746657%3C/proquest_askew%3E%3Cgrp_id%3Ecdi_FETCH-LOGICAL-a31610-e2dc75d1b93bade4d546a1ea0d3f5e72aafaf56936cec3667780de9da3f36b2c3%3C/grp_id%3E%3Coa%3E%3C/oa%3E%3Curl%3E%3C/url%3E&rft_id=info:oai/&req.language=eng&rft_pqid=EBC4746657&rft_id=info:pmid/

Others

- Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter:
 - <https://www.amazon.com/Python-Data-Analysis-Wrangling-Jupyter-dp-109810403X/dp/109810403X/>.
 - Library link:
https://na02.alma.exlibrisgroup.com/view/uresolver/01UTAH_INST/openurl?ctx_ver=Z39.88-2004&ctx_enc=info:ofi/enc:UTF-8&ctx_tim=2022-08-03T12%3A18%3A11IST&url_ver=Z39.88-2004&url_ctx_fmt=info:ofi/fmt:kev:mtx:ctx&rft_id=info:sid/primo.exlibrisgroup.com:primo3-Article-proquest_askew&rft_val_fmt=info:ofi/fmt:kev:mtx:book&rft.genre=book&rft.btitle=Python%20for%20Data%20Analysis&rft.au=Mckinney,%20Wes&rft.date=2017&rft.isbn=1491957662&rft.isbn_list=9781491957660&rft_id=info:doi/&svc_val_fmt=info:ofi/fmt:kev:mtx:sch_svc&svc.fulltext=yes&rft.eisbn=1491957638&rft.eisbn_list=9781491957639&rft.eisbn_list=9781491957615&rft.eisbn_list=1491957611&rft_dat=%3Cproquest_askew%3EEBC5061179%3C/proquest_askew%3E%3Cgrp_id%3Ecdi_FETCH-LOGICAL-a41313-86c47a261ea8e21e5b3b6e1ad43e69e7612b55516c3ec771aca505b1756ed2923%3C/grp_id%3E%3Coa%3E%3C/oa%3E%3Curl%3E%3C/url%3E&rft_id=info:oai/&req.language=eng&rft_pqid=EBC5061179&rft_id=info:pmid/
- Python for Data Science: A Hands-On Introduction:
 - <https://www.amazon.com/Python-Data-Science-Example-Vasiliev/dp/1718502206/>
- Learn Python the Hard Way

- <https://www.amazon.com/Learn-Python-Hard-Way-Introduction/dp/0321884914>
- Good exercises.

Canvas Information

Canvas is the where course content, grades, and communication will reside for this course.

- Access Canvas through utah.instructure.com or through [CIS \(Links to an external site.\)](#)
- For Canvas, Passwords, or any other computer-related technical support contact the [Campus Help Desk \(Links to an external site.\)](#).
 - 801 581-4000
 - <http://it.utah.edu/help> (Links to an external site.)
 - helpdesk@utah.edu
- For Canvas related issues or bugs, contact the Teaching & Learning Technologies help desk
 - 801-581-6112 ext 2
 - classhelp@utah.edu

Course outline

Tentative Course Modules

Module	Lecture Content	Assignments
1. Introduction, setup and environment	Course expectations, discussion of python and the python environment, GitHub.	Set up Screenshot
2. Simple Data Types	Introduction to Python primitives (numerics, booleans and strings)	
3. Complex Data Types	Non-Primitives (lists, sets, tuples and dicts)	Assignment 1

4. Simple Logic	Introduction to if, loops and functions	Assignment 2, Project Proposal Due
5. Advanced functions and logic	Introduction to scope, recursion, lambda functions, Searching and Sorting, Biopython package.	Assignment 3
6. Debugging	Try, Catch, Print and PDB, SDLC	Assignment 4
7. Object Oriented Programming (OOP)	Class and object syntax, inheritance and operator overloading, Method overriding.	
	FALL BREAK	
8. Introduction to common packages and environments	Numpy, Pandas and Matplotlib, Intro to Linear algebra, working with files.	
9. Data Manipulation	Cleaning and importing in numpy and pandas	Assignment 5
10. Reading in Dynamic Data	SQL (web scraping, Time Series Data.)	Assignment 6
11. Advanced Data Manipulation	Melt, Pivot, Aggregations and iteration	Assignment 7
12. Manipulating Text	Regex	

13. Effective Visualizations	Matplotlib and beyond	Assignment 8
14. Overview of analytical methods	SKlearn, Scipy and beyond	
		Project Due, Final
		Final Due

TEACHING METHODS:

Canvas, the University of Utah's online teaching resource, will be used to manage the course readings and other materials. Class will be held in a hybrid or online format using video conferencing. Didactic learning will include a lecture with Q&A, and discussion of readings (2-3 papers or chapters per session). Invited guest speakers will present lectures on relevant topics. Didactic content will be supplemented with tutorials and hands on activities. Class communications will be augmented with use of data and software engineering project management tools including Git, Slack and Jira.

TEACHING PHILOSOPHY

Biomedical Informatics is defined as “the interdisciplinary, scientific field that studies and pursues the effective uses of biomedical data, information, and knowledge for scientific inquiry, problem solving and decision making, motivated by efforts to improve human health” by the American Medical Informatics Association (<http://www.amia.org>) . We will work together with open communication in our seminars interactions to help each other succeed, be collegial, and build skills and knowledge.

EVALUATION

The course assignments, project, attendance and participation will result in a final course grade. Active participation is expected, by taking part in the discussions following/during presentations, asking questions, giving comments or suggestions, telling about similar research or methods and techniques, etc. For registered students grading will be Credit/No credit (CR/NC) and you will get credit if you attend and participate as described above.

Quizzes & Assignments: 70%

Class Code Review Presentations: 20%

Class Discussion/Participation: 10%

Grade Scale and Distribution

A	90-100	C	70-79
B	80-89	D	60-69
E	Less than 60		

Graduate-level thinking, writing, and independent study will be expected.

Policies and Other Resources

Attendance: "The University expects regular attendance at all class meetings. Instructors must communicate any particular attendance requirements of the course to students in writing on or before the first class meeting. Students are responsible for acquainting themselves with and satisfying the entire range of academic objectives and requirements as defined by the instructor." PPM, Policy 6-100III-O)

Late Assignment/Missed Assignments Policy:

Assignments will be accepted for two weeks past the due date if approved in advance of the due date by the instructors. Assignments not completed after 2 weeks are given a zero.

Attendance/tardy policy:

Official drop/withdraw date:

ADA statement: The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.

Addressing Sexual Misconduct:

Sexual misconduct is a broad term used to encompass a range of behaviors including Sexual or Gender-Based Harassment, Intimate Partner Violence, Sexual Exploitation, Stalking, Non-consensual Sexual Contact, and Non-consensual Penetration. Sexual misconduct also includes crimes of dating violence, domestic violence, sexual assault, and stalking as defined by state and federal law. University policy (and state and federal law) strictly prohibit retaliation against a person who files a discrimination complaint or participates in a discrimination complaint investigation. Protective measures can be offered to individuals involved in a disclosure of or formal complaint of sexual misconduct before, during, and after an investigation takes place. Students who are found responsible for assaulting or harassing another member of the University of Utah community may be suspended or dismissed. Some acts of Sexual Misconduct may also be violations of criminal law and the University encourages any person who has been criminally assaulted to immediately report the matter to the police.

See <http://regulations.utah.edu/general/rules/R1-012.php> for more information.

Academic code of conduct:

University of Utah policy does not tolerate any form of cheating (this does not pertain to tutorial help) or plagiarism of any kind. Plagiarism is defined as the verbatim use of four or more words from an unreferenced source. The University considers plagiarism a very serious offense which may result in a final grade of "E," and/or even suspension or expulsion.

Faculty and student responsibilities:

Accommodation policy:

Modifications of otherwise applicable reading, writing, viewing or performing requirements – are subject to the discretion of the instructor; instructors may deny accommodation requests as long as the subject course requirement has a reasonable relationship to a legitimate pedagogical goal. Instructors may grant content accommodation requests after considering the difficulty of administering an accommodation; the burden on the student's sincerely-held beliefs; the importance of the particular requirement to the course; and only if there is a reasonable alternative means of satisfying the curricular objective.

Wellness statement: Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a student's ability to succeed and Thrive at the University of Utah. For helpful resources, contact the Center for Student Wellness: www.wellness.utah.edu or 801-581-7776.

Veterans Center:

The University of Utah has a Veterans Support Center on campus. They are located in Room 161 in the Olpin Union Building. Hours: Monday

LGBT Resource Center:

Please let the instructor know if there is anything she can do to make the classroom environment more welcoming and respectful. Additionally, please recognize that the University of Utah has an LGBT Resource Center in campus. They are located in Room 409 in the Olpin Union Building. Hours: Monday – Friday, 8:00 am – 5:00 pm. Visit their website to find more about the support they can offer, a list of events through the center, and links to additional resources: (<http://lgbt.utah.edu/>)

Learners of English as an Additional Second Language:

If you are an English language learner, please be aware of several resources on campus that will support you with your language development and writing. These resources include: the Department of Linguistics EAS Program (<http://linguistics.utah.edu/eas-program/index.php>), the Graduate Writing Center, and the English Language Institute (<http://continue.utah.edu/eli/>).

Resources:

The course website is available in Canvas at <http://uonline.utah.edu/canvas/> with some details about the course, the schedule, slides available after the presentation and eventually before it, links to recorded meetings, links to references, etc.