OPIM 5512: Data Science Using Python

Spring 2025

Class:	Thu 18:15 - 21:15 DWTN 132	**Instructor:**	Jaeung Sim jaeung.sim@uconn.edu
Office Hours:	Thu 15:30 - 16:30 DWTN 386	**Prerequisites:**	OPIM 5604 Predictive Modeling

1 Course Overview

In this course, students will learn the basics of Python programming and implement advanced data science techniques based on the programming skills. With the assumption that students have concrete prior knowledge of basic data analytics but not technical familiarity with Python, this course introduces the details of Python libraries, the syntax structure and meaning, and application tips. Conceptually, it focuses on predictive analysis for real-world datasets using a wide range of methods covering linear regression, deep learning, tree-based models, and reinforcement learning.

All course materials will be provided through HuskyCT and Github, and there is no required textbook. Students should be able to implement Python via Google Colab in the classroom, and the details will be introduced in the first class. The tentative course schedule and content are briefly described in **Table 1**.

2 Grading Schemes

The grading items and their points are summarized in **Table 2**. Overall, class participation has 10% of significance, hands-on-based assignments and projects have 50% of weights, and two exams have 40% of weights in your grades.

2.1 Class Participation (100 points, 10%)

The instructor will call your name in each class. If you fail to respond during the class, it will affect your class participation score. Except for the first class, all students are expected to be present in the classroom. If students leave the classroom without the instructor's consent, their attendance might not be counted.

Virtual attendance is considered in exceptional cases, including school-approved requests for students, extreme events (e.g., hazardous weather conditions, the spread of fatal contagious diseases), and when the instructor cannot provide lectures in person due to valid reasons.

Students have **two tokens** that can compensate for absence. Considering the significance of missing two in-person classes, this course does not accept excuses for further absences. It is fully your responsibility to manage the risks of missing classes more than twice during the entire semester.

2.2 Hands-on Assignments (300 points, 30%)

The individual assignments aim to practice Python programming skills and enhance your understanding of data science. There will be three assignments that require you to handle real-world datasets and apply the concepts and techniques you learn in classes as follows:

- **Hands-on Homework #1 (Data Processing and Visualization):** You're going to process noisy real-world datasets and draw meaningful insights from exploring key statistics and visualizing the datasets.

Table 1: Tentative Course Schedule

Date	Format	Topics	Notes
01/23/2025	In person	Course Overview	
01/30/2025	In person	Basics of Python Programming	HW#1 out
		Data Structure, Processing, and Visualization	
02/06/2025	In person	Data Collection Methods	
02/13/2025	In person	Regression and Predictive Analysis	
02/20/2025	In person	Deep Learning: Basics	HW#2 out
02/27/2025	In person	Deep Learning: Advanced	
03/06/2025	In person	**Mid-term Exam**	
03/13/2025	In person	Deep Learning: Unstructured Data	HW#3 out
03/20/2025	N/A	*Spring Recess*	
03/27/2025	In person	Tree-based Models	
04/03/2024	In person	Reinforcement Learning: Basics	
04/10/2024	In person	Reinforcement Learning: Advanced	
04/17/2024	In person	**Term Project Presentation**	
04/24/2024	In person	Course Review & Final Exam Preview	
05/01/2024	In person	**Final Exam**	

- **Hands-on Homework #2 (Predictive Model Improvement):** In this assignment, you will try various model choices, including variable selections and hyperparameter tuning, and learn how they affect the predictive performance of models.
- **Hands-on Homework #3 (Image Processing):** It's time to go beyond numbers and texts! You're going to extract information from images and use it to draw managerial insights.

The detailed instruction will be provided later.

In your assignment, you might get help from digital resources, including online forums (e.g., Stack Overflow), generative AI tools (e.g., ChatGPT), and other online documents. However, you must do your assignment by yourself, and you are not allowed to let other people do your homework instead.

2.3 Term Project (200 points, 20%)

This project will be a group-based prediction competition, which will be evaluated based on 1) the performance of your predictive model, 2) the validity of your modeling and programming, and 3) the presentation of your approach. Here is a brief summary of the project procedure:

- The detailed instructions and training set will be provided in advance.
- Your team should explore model types, variable selection, and hyperparameters that are expected to show better performances in an unknown test set drawn from the same data generation function.
- You should document a Python notebook that presents the codes and outputs in your training process and submit a spreadsheet with predicted values for the test set.
- Your predictive performance will be evaluated based on the test set, the Python notebook will be used to validate your modeling process, and the presentation will evaluate how effectively you can communicate with others about your work.

Table 2: Grading Scheme Overview

Items	Points	Weights
Class Participation	100	10%
Hands-on Assignments	300	30%
Term Project	200	20%
Mid-term Exam	200	20%
Final Exam	200	20%
Total	1,000	100%

Combining your knowledge obtained from the classes and **Hands-on Homework #2**, do your best to achieve higher predictive performances for the unknown test set as much as possible.

2.4 Mid-term and Final Exams (400 points in total, 40%)

The exam format and coverage will be announced at least two weeks before the exam date. There will be no makeup exam unless a student is in an extremely exceptional, urgent, and verifiable circumstance. Importantly, the exams aim to test both your programming skills and data science knowledge, expecting the students to digest the overall content in this course.

3 Communication Policy

In all types of communication, please address me politely, use appropriate language, and be concise and specific in your questions or requests. Maintaining professionalism and mutual respect helps create a positive and collaborative learning environment. I encourage you to actively listen, thoughtfully engage in discussions, and approach feedback constructively. Together, we can ensure effective communication that supports your academic success.

3.1 Email

I will try my best to respond to your emails typically within 24 hours, except on weekends and national holidays. In your email, please briefly describe who you are, which course you are taking, and why you are reaching out to me. If you need urgent requests or don't get a response from me over 24 hours, I strongly encourage you to send me a reminder.

3.2 Feedback on Assignments

Before grading, I will answer clarification questions only. That is, I will not provide feedback directly related to your scores on your work, such as writing, programming codes, and slides, until I complete grading the assignment.

3.3 Request for Reevaluation

After you receive scores from assignments, quizzes, and the final exam, you might send me a rebuttal letter in one week. In this letter, you should clearly state for which parts and for which reasons you think your scores can change. For class participation and term projects, the instructor's evaluation criteria should be strictly respected, and the scores in these parts will change only if the instructor makes an apparent mistake in the evaluation.

4 Academic Integrity, Responsibilities, and Rights

The University of Connecticut is committed to fostering an intellectual community in which the highest ethical standards of academic, scholarly, and professional integrity prevail. For the detailed background and policies, please refer to the Office of University Compliance.

4.1 University Policies

4.1.1 Definitions

Academic Integrity: a commitment by the University Community to uphold just and ethical behaviors, which includes truthfulness, fairness, and respect (ICAI, 2021).

Scholarly Integrity: a commitment by the University community to both "... research integrity and the ethical understanding and skill required of researchers/scholars in domestic, international, and multicultural contexts. It is also intended to address ethical aspects of scholarship that influence the next generation of researchers as teachers, mentors, supervisors, and successful stewards of grant funds." (p. xix, Council of Graduate Schools, 2012).

Professional Integrity: standards of behavior defined by the various professions in which students are prepared through their degree or certificate programs.

Academic, Scholarly, and Professional Integrity Misconduct: unethical academic and scholarly behavior during a course (e.g., on an assignment or exam), as part of other degree requirements (e.g., requirements regarding placement, capstone or comprehensive exams, or placement exams), or at other times during undergraduate, graduate, or professional study and performance, including during engagement in fieldwork, clinical placements, or research.

These behaviors include **cheating**, **plagiarizing**, **misrepresenting**, **noncompliance**, and so on. Further details are available at the Office of University Compliance.

4.1.2 Policy Statement

All members of the university community, including administrators, faculty, staff, and students, have a shared responsibility to uphold the highest ethical standards of academic, scholarly, and professional integrity and to report any violations of those standards of which they are aware.

Student Expectations: To uphold the principle of academic and scholarly integrity in all aspects of their intellectual development and engagement at the University, students are expected to:

- be responsible for their own work and their own actions related to all academic and scholarly endeavors.
- assume they are to do independent work and seek clarification prior to collaborating with others or using outside resources.
- understand and abide by the standards, protocols, and guidelines to which they must adhere in research, creative, or professional activities.

If students witness or become aware of a violation of academic or scholarly integrity, they are encouraged to communicate this to the appropriate university representative (e.g., faculty, staff, advisor).

A cumulative record is maintained of all academic or scholarly integrity violations and such record will be reviewed and considered as part of subsequent incidences. Individuals engaged in research are expected to follow all standards, rules and regulations that guide the proper conduct of research or creative activity.

4.1.3 Enforcement

Violations of this policy and its related procedures may result in appropriate disciplinary measures in accordance with University By-Laws, General Rules of Conduct for All University Employees, applicable collective bargaining agreements, and the University of Connecticut Student Code.

Note that student misconduct is governed by the University's Student Code, which is administered under the direction of the Division of Student Affairs, as follows:

> *"We never educate directly, but indirectly by means of the environment. Whether we permit chance environments to do the work, or whether we design environments for the purpose makes a great difference." (John Dewey 1933, p. 22).*

Enforcement of its provisions is the responsibility of the Director of Community Standards (for undergraduate students), The Graduate School (for graduate students), and the Office of the Vice President for Research (for research misconduct). Identified misconduct will be routed to the appropriate unit.

4.2 Support for Student Rights

Students with Disabilities: The University of Connecticut is committed to protecting the rights of individuals with disabilities and assuring that the learning environment is accessible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, please let me know immediately so that we can discuss options. Students who require accommodations should contact the Center for Students with Disabilities, Wilbur Cross Building Room 204, (860) 486-2020 or csd@uconn.edu.

Policy Against Discrimination, Harassment, and Related Interpersonal Violence: Discrimination and discriminatory harassment based on any protected class(es), and sexual harassment are prohibited under the University's Policy Against Discrimination, Harassment and Related Interpersonal Violence as follows:

> *"The University of Connecticut (the "University") is committed to maintaining a safe and non-discriminatory learning, living, and working environment for all members of the University community – students, employees, and visitors. Academic and professional excellence can exist only when each member of our community is assured an atmosphere of safety and mutual respect. All members of the University community are responsible for the maintenance of an environment in which people are free to learn and work without fear of discrimination, discriminatory harassment or interpersonal violence. Discrimination diminishes individual dignity and impedes equal employment and educational opportunities."*

For further details, please refer to the Office of Institutional Equity (or contact through (860) 486-2943 or equity@uconn.edu).

Sexual Assault Reporting Policy: The University of Connecticut is committed to cultivating and maintaining an environment free from all forms of sex-based discrimination, harassment, and sexual misconduct. It is important for individuals who are impacted by sexual harassment or any other form of sexual violence to know that the resources contained on this website can offer assistance regardless of whether any formal administrative or criminal process is initiated. This includes help with medical and counseling services, academic and housing support, referrals to legal and confidential advocacy organizations, and assistance with working, visa and immigration, transportation, financial aid matters and more. More information is available at Title IX at UConn. To get help from the University, please contact the Office of Institutional Equity via (860) 486-2943 or equity@uconn.edu.