

Python with Applications II

PIC 16B, Winter 2025

Logistics

Course website: <https://bruinlearn.ucla.edu/courses/191523>

Lecture 1 MWF 12-12:50pm Bunche Hall 1221A

Discussion 1A: TR 12-12:50pm Mathematical Sciences 6221

Instructor: Seyoon Ko (kose@math.ucla.edu).

Office hours: M 10:30-11:30am / W 1-2pm Mathematical Sciences 5242 or by appointment

Teaching assistant: Alex Sietsema (alexsietsema@math.ucla.edu)

TA Office hours: TBD

The office hours are subject to change, so please always check the [Bruin Learn course website](#) for the latest office hours.

Waitlist policy: PIC doesn't use PTEs. Please see the relevant policy posted on [this website](#). If you're on the waitlist, you can expect to be enrolled after the waitlist period is over (Week 2).

Course prerequisites: PIC 16A or consent of instructor (enforced)

Textbook: None! Often, a nice step to take when you face an error is reading the error messages → official documentation → Stack Overflow → other resources in Google.

Official documentation: <https://docs.python.org/3/library/index.html>

Official tutorial: <https://docs.python.org/3/tutorial/index.html>

Overview

In-depth application of Python programming language to problems arising in a variety of areas of current interest, such as machine learning, computer vision, statistical analysis, numerical analysis, and data acquisition. Advanced Python programming techniques to improve computational efficiency.

Course objectives: Students will create complex Python programs to solve problems of interest in science and industry. Students will effectively deploy a range of Python packages to approach specialized tasks and develop an intuitive understanding of how these packages operate. Students will analyze and revise Python programs to improve clarity, robustness, and performance. Upon completion of this course, students will be able to write, analyze, and communicate about Python programs that accomplish a variety of complex computational tasks, including:

- Acquiring data sets via databases or web-scrapers.
 - Analyzing data using complex manipulation and visualizations.
 - Constructing complex machine learning pipelines for structured, image, and text data sets.
 - Solving problems in computational mathematics, including systems of linear equations, eigenvalue problems and singular value decomposition, optimization, differential equations, and simulations.
 - Enhancing program performance using multithreading.
- Additionally, students will be able to identify and install Python modules to achieve a wider variety of tasks than those directly covered in the course.

Topics (tentative):

- Version control with Git and GitHub
- Documentation using Quarto
- Advanced data processing using databases (Pandas, SQLite3, Polars, DuckDB)
- Interactive visualization (Plotly)
- Web scraping (BeautifulSoup, Scrapy)
- Web Development (Dash)
- Overview of computational mathematics
- Just-in-time (JIT) compilation, parallel computing, and automatic differentiation for scientific computing (JAX)
- Deep learning with TensorFlow, PyTorch, Keras

Grades

This class includes **7 homework assignments**, a **group project**, participation grades tracked via **iClicker**. Each component contributes to your grade through a “Class Point” system, with opportunities for extra credit. To **earn an A**, you must achieve at least **57 out of 70 Homework Points**, **complete your group project**, actively participate in a sufficient number of **iClicker** polls, and score **80% or higher on the quizzes**. For reference, in the previous quarter, students with at least 90% participation in polls had a minimum quiz score of 80%.

Homework

Each of the seven homework will be graded out of 10 Homework Points. They may be tough, but you will learn a lot. For each homework assignment, you will be writing a form of *blog post* or *tutorial*. You will earn full credit as long as you meet a set of *specs* provided with the homework, and some specs will be autograded. You’ll have an opportunity to resubmit your work if you want to. Discussing how to solve problems is encouraged, but everyone should still write and submit their own code and report. Code sharing is not allowed. Homeworks can be submitted up to five days late, with a one-point deduction for each late day, rounded up to whole days. You will still be able to earn A even if you miss one homework assignment.

- 11 Class Points: 67 HW Points
- **10: 57 HW Points**
- 9: 48 HW Points, with at least 5 HW Points total from the last two HWs
- 8: 42 HW Points
- 7: 36 HW Points
- 6: 30 HW Points

Project

One of the most important components of PIC16B is the project. Over the course of the quarter, you will:

- Identify an interesting and relevant problem that can be solved using computational methods.
- Acquire data relevant to your problem.
- Design and implement a computational solution to your problem.
- Provide periodic progress updates to your classmates.
- Offer feedback to your peers.
- Revise your project based on the feedback received.
- Host your project in a GitHub repository as part of your code portfolio.

You are expected to work in a group of 2-3 students on the project. If you wish to work in a larger group or individually, you must first request approval from me.

Your overall project grade will consist of several components, including:

- A project pitch.
- A project proposal (completed with your group).
- Two project updates, due in Week 6 and Week 8.
- A project presentation in Week 10 (March 12-14, during regular class time) or during the Finals slot (Wednesday, March 19, 3-6 pm).
- Peer reviews of project updates and final presentations.
- Final project submission during Finals week (Friday, March 21, 11:59 pm).

Each component will have specific requirements provided in advance. Project grading is based on completion, and most students will earn 10 Class Points as long as their project is complete and all project assignments are submitted on time.

- 13 Class Points: Awarded for an excellent project (only if you also earn at least 10 Class Points from Homework and 5 Class Points from both Participation and Quiz).
- **10 Class Points:** For a complete project.
- 5-9 Class Points: For missing one or more project assignments or insufficient participation.
- 0-4 Class Points: For an incomplete project.
- Direct F: For non-participation in the final presentation and/or failure to submit the final project report.

Participation

Lecture attendance is expected. The iClicker will be used for the participation grade. This will be split into two parts: 50% Quiz and 50% in-class Poll. For both quiz and poll, the average of daily percentages after dropping the six lowest days will be used. At least one of quiz or poll will be used in each lecture; the quiz may be used in discussion sessions.

The Quiz deals with the material covered in previous lectures, and the Poll covers the material covered that day. The quiz problems are in multiple choice or short answer format and are graded on correctness. It will have a 3-10 minute time limit.

The in-class poll may be any format supported by iClicker with flexible time limits. For poll, you will earn full marks for the day as long as you respond to at least 50% of the questions asked that day, regardless of correctness.

That means that if you participate in enough polls, you will earn at least 10 Class Points as long as you earn 80% on the quizzes after dropping the six quizzes with the lowest score. The quiz's difficulty will vary with each lecture, but some questions will be very simple.

- 11 Class Points: 98% or higher
- **10: 90% or higher**
- 9: 85% or higher
- 8: 80% or higher
- 7: 70% or higher
- 6: 60% or higher

Extra credits

One extra point may be used as either 0.5 HW Points or one extra percentage point on Participation. Up to nine extra points are available.

- One extra point for each survey (three surveys)
- Up to two extra points for participation in CampusWire and office hours
- One extra point for each extra peer review in the project update presentations (up to two for each update)

Final grades

The following scale will be used to determine the final letter grade.

- A+: 33 points or above
- **A: 30-32 points**
- A-: 29 points
- B+: 28 points
- B: 27 points
- B-: 26 points

- C+: 25 points
- C: 24 points
- C-: 23 points
- D+: 22 points
- D: 21 points
- D-: 20 points
- F: 19 points or below

Other Information

Our inclusive learning environment: UCLA values diversity and inclusion. We expect everyone in this class to contribute to a respectful, welcoming, and inclusive environment to support the learning of all other members of the class. If there are aspects of the instruction or design of this course that result in barriers to your inclusion or accurate assessment or achievement, please notify us.

Notice about academic integrity: From the office of the Dean of Students:

“With its status as a world-class research institution, it is critical that the University uphold the highest standards of integrity both inside and outside the classroom. As a student and member of the UCLA community, you are expected to demonstrate integrity in all of your academic endeavors. Accordingly, when accusations of academic dishonesty occur, The Office of the Dean of Students is charged with investigating and adjudicating suspected violations. Academic dishonesty includes, but is not limited to, cheating, fabrication, plagiarism, multiple submissions, or facilitating academic misconduct.”

Students are expected to be aware of the University policy on academic integrity in the UCLA Student Conduct Code:

<https://www.deanofstudents.ucla.edu/Individual-Student-Code>

Please note the sections on (1) cheating, (2) plagiarism, and (3) unauthorized study aids, and (4) unauthorized collaboration.

Collaboration:

Discussing how to approach homework assignments with your colleagues is welcome. Please be sure to state who you worked with and for which problems. If you received help from someone else or any other online resources, please cite them. **Code sharing is not allowed, and submissions with high similarity may receive a deduction or other consequences.** For group assignments, collaboration is allowed within the group. Any other form of collaboration not listed here, including the quizzes, is explicitly disallowed.

Use of Artificial Intelligence Tools:

The UCLA Student Conduct Code states, “Unless otherwise specified by the faculty member,

all submissions, whether in draft or final form, to meet course requirements (including a paper, project, exam, computer program, oral presentation, or other work) must either be the Student's own work, or must clearly acknowledge the source." Unless an instructor indicates otherwise, the use of ChatGPT or other AI tools for course assignments is akin to receiving assistance from another person and raises the same concern that work is not the student's own. AI tools can give students false confidence that they understand the concepts and tools in this class better than they actually do. AI solutions are often wrong, and even when correct, model ways of getting to solutions that are very different from the ones that we will be studying together. **For this course, the use of AI tools beyond grammar check, autocompletion, and autocorrection is not allowed. If AI tools, including Grammarly, GitHub Copilot, etc., are used for the functionalities whitelisted, you must declare which tools are used, and how you used it for each assignment.**