Introduction to Programming with Economic Data
Econ 390 (3 Credits), Fall 2024
University of Wisconsin-Madison

Instructor

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Instructional Mode

In-Person Classroom Instruction

Course Overview

This course provides an introduction to computer programming using the Python programming language, with an emphasis throughout on economic applications and the analysis of economic data. Research in economics often involves the use of computers for simulation and/or estimation. The computing component of a project will ideally be efficiently coded, well organized, fully documented, and replicable. Students will be introduced to these skills, and by the end of the class will feel comfortable using Python (along with libraries such as pandas and matplotlib) to manage, transform, and analyze data.

This course is intended for those who do not have previous experience programming in Python. If you already know Python, then you should consider taking Econ 570 (Fundamentals of Data Analytics for Economists), where students who are proficient in Python tackle more advanced methods in data analytics.

Prerequisites

The prerequisite for this class is Econ 310.

Class Meetings and Office Hours

Lecture is **Tuesdays and Thursdays** from **2:30pm to 3:45pm** in **Mechanical Engineering 1163**.

My office hours can be found on our class website.

Required Course Materials

Our textbook is: Python for Data Analysis by Wes McKinney, Third Edition. The book is available for free on the author's website:
        https://wesmckinney.com/book/

This course requires a **laptop** (Mac or Windows) that you can (a) bring with you to every lecture and discussion section and (b) you can use to complete the weekly problem sets. You will also need access to a **reliable internet connection**.

Course Webpage

Lecture notes and all other course materials will be posted on our course website:
https://canvas.wisc.edu/courses/413337

Evaluation

Your overall grade for the course will be based on the following components:

- Attendance: I'll track attendance at each lecture using Top Hat. Attendance is worth 20% of your overall grade, and you must be physically present in lecture to be marked present. If Top Hat marks you as absent in error, you are responsible for coming to the front of the classroom to let me know immediately after class. To allow everyone a bit of flexibility, everyone is **allowed six excused absences**. Save these excused absences for a rainy day (illnesses, family emergencies, etc), since **I will not, under any circumstances, excuse additional absences**.

- Problem sets: There will be weekly problem sets, which together are worth 40% of your overall grade – so completing them will be critical to your success. **For full credit, problem sets must be submitted in Canvas before the submission deadline.** Late problem sets may be submitted after this deadline, but will receive a **20% per day deduction.** As you think about the assignments, you're welcome to chat about the problems with your classmates, ask questions in office hours, search the internet, and even consult artificial intelligence. However, when it comes time to write-up your answers, you must do so independently. In other words, as you write your own answers, you should NOT simultaneously be looking at text written by anyone else. If you wish to paste in text from another source (e.g., from a website or from an AI like ChatGPT) as part of your answer, then you must clearly indicate you have done so and let us know the source of the text. If you submit text that isn't your own without attribution, your entire submission will not be accepted (i.e., you will receive zero credit for the assignment).

- Midterm Exam: There will be a pen-and-paper midterm, which is worth 20% of your overall grade. The midterm exam will be held **in-person** during our regularly scheduled lecture on October 24. ***Ensure you are available to come to class that day.*** If you are unable to take an exam due to a circumstance that is beyond your control, let me know and we will discuss how best to proceed. To qualify for an accommodation, the circumstance must make it impossible for you to complete the midterm at the scheduled time, it must be fully documented, and you must notify me in advance of the midterm.

- Final Exam: There will be a pen-and-paper final exam, which is worth 20% of your overall grade. **The final must be taken in-person during our official final exam block on Thursday December 19 from 12:25pm to 2:25pm.** It is not possible to reschedule the final, even when students have multiple exams in a 24 hour period. However, if you have another exam at exactly the same time, let me know within the first two weeks of the semester and we'll discuss how best to proceed.

Your overall grade for this class will be curved. This curve can help your grade, but cannot hurt it. I achieve this by computing your grade using two different methods. First, I assign grades according to a percentage scale, where A = [92,100], AB = [88,92), B = [82,88), BC = [78,82), C = [70,78), D = [60,70), F = [0,60). (In other words, if you receive a grade in the class of 92% or better, then you'll receive an A.) Second, I assign grades according to a percentile scale, where A = [75,100], AB = [50,75), B = [30,50), BC = [10,30), C = [5,10), D = [2,5), F = [0,2). (In other words, if you perform better than 75% of the class, then you'll receive an A). Your overall grade in the class is the higher of these two grades.

I strive to make all of the grading transparent and fair. If you are unhappy with the way a problem has been graded, I encourage you to discuss it with me, but you must bring the concern to me within two weeks of when you were first able to view the graded problem set or exam.

Learning Outcomes

Following the completion of this course, students will be able to:

- Understand the fundamentals of coding with Python, including being able to import packages, store data with built-in Python data types, manage control flow with loops and conditionals, and write user-defined functions.

- Retrieve cross-sectional, time-series, and panel data from websites and public APIs, store the data in Pandas Series and DataFrames, merge data from different sources, and transform/clean data so it is ready for analysis.

- Calculate economic statistics for Pandas DataFrames as a whole, and also be able to stratify the analysis to determine whether there are heterogenous results for different sub-groups of the population.

- Visualize economic data with Matplotlib line plots, histograms, bar charts, and scatter plots to effectively communicate quantitative ideas through figures.

- Understand the importance of efficient, well-organized, and fully-documented code when conducting economic analysis so results can be replicated and extended.

Credits

This 3-credit course meets for two 75-minute lectures each week, with the expectation that students will work on course learning activities (reading, completing problem sets, studying, etc) for about 8 hours per week outside of the classroom.

Course Outline

This course covers the following topics (readings from McKinney in parentheses):

- Lecture 1: Introduction

- Lecture 2: Jupyter Notebooks in JupyterLab
- Lecture 3: Markdown
- Lecture 4: Variables and Types
- Lecture 5: Data Structures (Lists, Tuples, and Dicts)
- Lecture 6: Booleans and Conditionals
- Lecture 7: Loops
- Lecture 8: Slicing and String Manipulation
- Lecture 9: User-Defined Functions and Packages
- Lecture 10: Pandas Data Structures (Series and DataFrames)
- Lecture 11: Pandas IO Tools (Reading and Writing Files)
- Lecture 12: Pandas Calculations
- Lecture 13: Line Plots with Matplotlib
- Lecture 14: More Plot Types with Matplotlib
- Lecture 15: Matplotlib Stylesheets
- Lecture 16-17: Retrieving data from APIs
- Lecture 18-19: Merging
- Lecture 20-21: Groupby
- Lecture 22: Transformations
- Lecture 23: OLS
- Lecture 24: R and Stata Integration

Students with Disabilities

If you have approval from the McBurney Center for disability-related accommodations, please contact me to discuss how these accommodations will be implemented for this course. This should be done as soon as possible, and no later than two weeks before the first exam.

Religious Observances

If an exam or problem set conflicts with a religious observance, let me know and we'll work together to make an accommodation. This should be done as soon as possible, and no later than two weeks before the conflict.

Grievance Procedure

The Department of Economics has developed a grievance procedure through which you may register comments or complaints about a course, an instructor, or a teaching assistant. The Department continues to provide a course evaluation each semester in every class. If you wish to make anonymous complaints to an instructor or teaching assistant, the appropriate vehicle is the course evaluation. If you have a disagreement with an instructor or a teaching assistant, we strongly encourage you to try to resolve the dispute with him or her directly. The grievance procedure is designed for situations where neither of these channels is appropriate.

If you wish to file a grievance, you should go to room 7238 Social Science and request a Course Comment Sheet. When completing the comment sheet, you will need to pro-

vide a detailed statement that describes what aspects of the course you find unsatisfactory. You will need to sign the sheet and provide your student identification number, your address, and a phone where you can be reached. The Department plans to investigate comments fully and will respond in writing to complaints.

Your name, address, phone number, and student ID number will not be revealed to the instructor or teaching assistant involved and will be treated as confidential. The Department needs this information, because it may become necessary for a commenting student to have a meeting with the department chair or a nominee to gather additional information. A name and address are necessary for providing a written response.

Misconduct Statement

Academic integrity is critical to maintaining fair and knowledge based learning at UW-Madison. Academic dishonesty is a serious violation: it undermines the bonds of trust and honesty between members of our academic community, degrades the value of your degree, and defrauds those who may eventually depend upon your knowledge and integrity.

Examples of academic misconduct include, but are not limited to: cheating on an examination (copying from another student's paper, referring to materials on the exam other than those explicitly permitted, continuing to work on an exam after the time has expired, turning in an exam for regrading after making changes to the exam), copying the homework of someone else, submitting for credit work done by someone else, stealing examinations or course materials, tampering with the grade records or with another student's work, or knowingly and intentionally assisting another student in any of the above. Students are reminded that online sources, including anonymous or unattributed ones like Wikipedia, still need to be cited like any other source; and copying from any source without attribution is considered plagiarism.

The Dept. of Economics will deal with these offenses harshly following UWS14 procedures (http://students.wisc.edu/saja/misconduct/UWS14.html):

1. The penalty for misconduct in most cases will be removal from the course and a failing grade,

2. The department will inform the Dean of Students as required and additional sanctions may be applied.

3. The department will keep an internal record of misconduct incidents. This information will be made available to teaching faculty writing recommendation letters and to admission offices of the School of Business and Engineering.

If you think you see incidents of misconduct, you should tell your instructor about them, in which case they will take appropriate action and protect your identity. You could also choose to contact our administrator (Tammy Herbst-Koel: therbst@wisc.edu) and your identity will be kept confidential.