

ECE 20875: Python for Data Science

Fall 2019

Lectures: Tuesdays and Thursdays, 9:00–10:15

Section 1: Brown 1154

Section 2: WTHR 160

Course web page: <https://engineering.purdue.edu/~milind/ece20875/2019fall/>

Piazza discussion page: piazza.com/purdue/fall2019/ece20875/home

Course calendar: <https://bit.ly/2yNiUSt>

Instructors:

Section 1:

Milind Kulkarni (milind@purdue.edu)

Office: EE 324A

Office Hours: Tuesday 10:30–noon; Wednesday 1:30–3

Section 2:

Chris Brinton (cgb@purdue.edu)

Office: MSEE 342

Office Hours: Monday 1:30–3; Thursday 10:30–noon

Lead TA:

Sonosmita Mitra (mitra26@purdue.edu)

Undergraduate TAs:

Tyler Baumgartner

Colin Harrison

Pratyaksh Sharma

TA Lab Hours:

M–F 11:30–12:30 and 6:00–8:00

Course Outcomes: A student who successfully fulfills the course requirements will have demonstrated:

1. An understanding of regular expressions [1, 2]
2. An ability to use Python to write data analyses [1, 2, 6]
3. An ability to explain when particular data analyses are appropriate [1, 2, 3, 6]
4. An ability to explain the results of data analyses [2, 3, 5]
5. An ability to incorporate classes in their Python programs [1, 2, 6]
6. An ability to incorporate associative arrays in their programs [1, 2, 6]

7. An ability to work with a partner to choose appropriate analyses to solve a problem, perform those analyses, and interpret the results of those analyses [1, 2, 3, 5, 6]

These outcomes are extremely high level. In more detail, after taking this course you will be able to:

- Perform basic scripting tasks in Bash and Python (e.g., redirecting the output of one program to the input of another, setting and reading environment variables)
- Write programs in Python that incorporate: basic control structures; functions; data structures such as lists, tuples and associative arrays; classes and objects; iterators and generators; higher order functions; and regular expressions
- Understand the basics of sampling, estimation, and hypothesis testing
- Write data analyses that perform: visualization; textual analysis; regression; classification; clustering
- Perform more complex analyses using approaches like neural networks.

Course assessment: The achievement of the course objectives will be through 10 programming assignments (covering outcomes 2, 4, 5, and 6), two midterms (covering outcomes 1, 3, and 4), and a final project (covering outcome 7)

Course grading: Grades will be assigned as follows:

- 50% — Programming assignments (5% per assignment)
- 30% — 2 midterms, one final (10% each)
- 20% — Final project
- 5% bonus — Class participation

Class participation will be assessed by participation in class as well as on the Piazza discussion board.

Programming assignments: Programming assignments will be due each week, except for the weeks of the midterms and during the final three weeks (which is set aside for project development). They will test the concepts covered in class, both programming and statistical. The following rules apply to *all* programming assignments:

1. All programs should run correctly in the versions of Python available on the Scholar cluster. You will have a Scholar account created for you at the beginning of the semester.
2. Your assignment submissions should be either (a) a Jupyter notebook (and any other accompanying files) with code that will produce the required output *and writeup*; or (b) a python script (or scripts) that will produce the required output when run as well as a *separate* writeup.
3. Unless otherwise specified, assignments are due at 11:59 PM on the deadline.

Programming assignments will be submitted via GitHub Classroom (<https://classroom.github.com>). As such, *you are required to have a GitHub account*. These can be obtained for free at <https://github.com>.

Please fill out the form here: <https://forms.gle/d4H9vMphUWunx7Kr6> to provide your GitHub account information.

Late submission policy: Except for medical and family emergencies (accompanied by verification), there will be *no individual extensions* granted for programming assignments. Late submissions will be scaled according to lateness, docking 10% from your score per day late, up to a maximum of 50%. Submissions more than 5 days late will be assigned a score of 0.

Course Discussion: This term we will be using Piazza for class discussion. If you have questions about the course or the project, we encourage you to post them on Piazza. It's a shared discussion forum, where your question can be answered by the instructors, the TAs or your fellow students!

Find our class's Piazza page at: piazza.com/purdue/fall2019/ece20875/home

Students who are active participants on Piazza may receive class participation bonus points.

Email: Questions about course material or programming assignments *should be posted to Piazza* or raised during lecture or office hours. The professor and TAs will not answer programming questions via email. This is to allow other students who might have similar questions to benefit from our answers. Of course, if you have questions of a personal or confidential nature, we welcome your email.

Course announcements: Course announcements, including changes in due dates, course topics, programming assignment details, etc., will be communicated in three ways:

1. Posts on Piazza.
2. Changes on the shared course calendar.

Course Schedule: Below is a rough schedule of what will be covered in class:

Week	Topic(s) covered
1	Bash scripting (environment variables and input/output redirection); Git basics; Python basics (control structures, functions)
2	Python data structures (lists, tuples, associative arrays)
3	Histograms; probability distributions

Week	Topic(s) covered
4	Higher-order functions; map/reduce
5	Regular expressions; basic text processing
6	More regular expressions; n-gram analysis; Midterm 1
7	Sampling, estimation, and hypothesis testing
8	Hypothesis testing (cont.); regression (ordinary least squares; autoregressive models)
9	Classes and objects; clustering (k-means, mixture models)
10	Objects (cont.): iterators and generators; classifiers (kNN, naive Bayes)
11	Objects (cont.): inheritance; perceptrons
12	Neural nets; Midterm 2
13	Neural nets (cont.)
14	Project lectures (special topics)
15	Project lectures (special topics)

Academic Honesty: Unless expressly allowed, you are expected to complete all assignments by yourself. However, you are allowed to discuss general issues with other students (programming techniques, clearing up confusion about requirements, etc.). You may discuss particular algorithmic issues on Piazza (but do not copy code!). *We will be using software designed to catch plagiarism in programming assignments, and all students found sharing solutions will be reported to the Dean of students.*

Punishments for academic dishonesty are severe, including receiving an F in the course or being expelled from the University. By departmental rules, all instances of cheating will be reported to the Dean. On the first instance of cheating, students will receive a 0 on the assignment; the second instance of cheating will result in a failure of the course.

Campus Interruptions: In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. In such an event, information will be provided through the course website, Piazza, and email.