

# ECE 20875: Python for Data Science

Spring 2021  
Course Syllabus

## Instructors

### Section 001 (CRN: 20850) and OL1 (online, CRN: 26289)

Prof. David Inouye ([dinouye@purdue.edu](mailto:dinouye@purdue.edu))

Office: EE 332

Virtual office hours: Mon 3:30-4:30pm (updated) and Wed 10:30-11:30am

Lectures (Sec 001): Tues/Thurs, 10:30am-11:45am ET in EE 129

Lectures (Sec OL1): Online only (live Zoom at times above or recorded Zoom)

### Section 002 (CRN: 24462)

Prof. Qiang Qiu ([qqiu@purdue.edu](mailto:qqiu@purdue.edu))

Office: MSEE 358

Virtual office hours: Tues and Thurs 1-2pm

Lectures (Sec 002): Mon/Wed/Fri, 11:30am-12:20pm ET in ME 1061

***See pinned post on Piazza for video and office hour links.***

## Graduate TAs

Somosmita Mitra [Lead] ([mitra26@purdue.edu](mailto:mitra26@purdue.edu))

Serena Nicoll ([snicoll@purdue.edu](mailto:snicoll@purdue.edu))

Ziyu Gong ([gong123@purdue.edu](mailto:gong123@purdue.edu))

## Undergraduate TAs

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• Alexander Macleod Gieson	<a href="mailto:agieson@purdue.edu">agieson@purdue.edu</a>
• Bowen Zheng	<a href="mailto:zheng545@purdue.edu">zheng545@purdue.edu</a>
• Emad Butt	<a href="mailto:butt4@purdue.edu">butt4@purdue.edu</a>
• Ethan Glaser	<a href="mailto:glasere@purdue.edu">glasere@purdue.edu</a>
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• Xiangyu Zhang	zhan2938@purdue.edu
• Yiyang Shui	shuiy@purdue.edu
• Yueting Mary Zhao	zhao979@purdue.edu

### Communication via Piazza

We will use Piazza as the primary form of announcements and communication between the teaching staff and the students. **If you have any questions about the course, homeworks, or projects, you should post them on Piazza.** It is a shared discussion forum, where your question can be answered by the instructors, the TAs or your fellow students! *All students are expected to join the Piazza classroom within the first week of class and preferably as soon as possible.*

Find our Piazza page here:

<http://piazza.com/purdue/spring2021/ece20875>

### Class Website

To maintain consistency across the sections, we will manage a separate website for the course. This website will have links to the course material, assignments, and other information. Brightspace will be used *solely* to enter and track your grades. All other matters for the course will be administered through Piazza and the website.

Find our course website here:

<https://www.davidinouye.com/course/ece20875-spring-2021/>

### Sections and Lecture Options

There are three sections of the course: 001, 002, and OL1 (distance). All three sections of the course will be managed very similarly. They will have the same homeworks, the same discussion forum, the same announcements, and, as much as possible, the same lectures. The primary exception to this is the lecture component described next.

Both professors will give their lectures in person and live over Zoom during the schedule class times and locations (see above). We will also record the live Zoom session and post the lecture recordings for asynchronous learners. Thus, you will have 3 options for lectures:

1. Attend lectures in-person during assigned class times (except for online section)
2. Attend lectures virtually via Zoom during assigned class times
3. Watch recorded Zoom lectures

Because of reduced room capacity caused by COVID restrictions, **we will use the In-Person Course Planning Tool to assign you to groups that can attend in-person.** Each student will be assigned one or more days that you can attend in person. The assigned times can be seen myPurdue Scheduling Assistant. On other days, please attend live via Zoom at the normal lecture times (except for the OL1 section).

Given COVID complications, attendance will not be required though students are responsible for knowing anything discussed in the lectures. We strongly encourage students to attend in-person (preferred) or live on Zoom if at all possible. This will allow students to ask questions live and provide structure in the day. **See pinned post on Piazza for live Zoom and recorded lecture links.**

### **Attendance Policy during COVID-19**

While attendance will not be a factor in the final grades, students are expected to attend all classes in-person or live via Zoom (or watch recorded lectures in a timely fashion) unless they are ill or otherwise unable to attend class. If they feel ill, have any symptoms associated with COVID-19, or suspect they have been exposed to the virus, students should stay home and contact the Protect Purdue Health Center (496-INFO).

*In the current context of COVID-19, attendance will not be a factor in the final grades.* Students need to inform the instructor of any conflict that can be anticipated and will affect the timely submission of an assignment or the ability to take an exam.

Classroom engagement is extremely important and associated with your overall success in the course. The importance and value of course engagement and ways in which you can engage with the course content even if you are in quarantine or isolation, will be discussed at the beginning of the semester. Student survey data from Fall 2020 emphasized students' views of in-person course opportunities as critical to their learning, engagement with faculty/TAs, and ability to interact with peers.

Only the instructor can excuse a student from a course requirement or responsibility. When conflicts can be anticipated, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency conflicts, when advance notification

to an instructor is not possible, the student should contact the instructor/instructional team as soon as possible by email, through Brightspace, or by phone. In cases of bereavement, quarantine, or isolation, the student or the student's representative should contact the Office of the Dean of Students via [email](#) or phone at 765-494-1747. Our course Brightspace includes a link to the Dean of Students under 'Campus Resources.'

### **TA Lab Hours**

We are fortunate to have many wonderful graduate and undergraduate TAs on the teaching staff this semester. Many of the TAs have taken the class before and/or previously served as a TA. With their help, we are able to offer the following TA lab hours schedule:

- *Virtual lab hours (Discord):*  
8-10am ET, 1-2pm ET, and 5-8pm ET, Monday through Friday
- *Limited in-person lab hours in EE 206 and EE 207:*  
*22 person limit*  
MTRF 5:00-8:00 pm ET  
W 5:30-8:00 pm ET

Please take advantage of these sessions to get one-on-one assistance, particularly for help on the homework assignments.

Due to COVID-19, the university has recommended that we conduct our office hours online. **As a result, office hours will be held using the Discord platform.** The protocol for using Discord is as follows:

- During lab hours, each TA will join one of the open voice channels in Discord. Students who have questions can join these voice channels to talk with a TA one-on-one and share screens if needed.
- After discussion, the student should leave the TA voice channel and go back to the general channel to allow other students to talk to the available TAs.
- Further instructions on Discord can be found on the class website.
- **See pinned post on Piazza for Discord link.**

### **Instructor Office Hours**

We will expect that you have been watching the lectures regularly and reviewing the notes before asking questions in office hours, i.e., these venues must be used as a supplement, not an alternate, to the lectures. Additionally, we will expect that you have put some effort into understanding the material before coming to office hours. During the instructor office hours, we will give preference to conceptual or clarification questions over debugging questions because debugging questions could be answered during the daily TA lab hours.

## Email

Technical questions should be posted to Piazza, raised during TA lab hours, or raised during instructor office hours (primarily questions on the lecture). This allows other students who might have similar questions to benefit from the answers. As a result, the professor and TAs will not typically answer programming questions via email. Of course, if you have questions of a personal or confidential nature, we welcome your email.

## 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:

- 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.
- 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).
- Understand the basics of sampling, estimation, and hypothesis testing.
- Write data analyses that perform: visualization; textual analysis; regression; classification; and clustering.
- Perform more complex analyses using approaches like neural networks.

**Course Assessment:** The achievement of the course objectives will be through programming assignments (covering outcomes 2, 4, 5, and 6), exams (covering outcomes 1, 3, and 4), and a project (covering outcome 7).

## Course Grading

Grades will be assigned as follows:

- 50% — Three exams (all equally weighted)
- 40% — 10-12 programming assignments (all equally weighted)
- 10% — Mini-project

The students who are the most active (and helpful) in answering questions on Piazza may receive bonus points.

### **Programming Assignments**

Programming assignments will be due every 1-2 weeks, except for the weeks of the exams and during the final two weeks (which is set aside for the mini-project). 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. Some assignments will include a separate writeup as well as a code submission that will produce the required output when run.
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 following form as soon as the semester starts to provide your GitHub account information:**

<https://forms.gle/yTEGCXbo7GoB3kpw6>

Without your GitHub username, we cannot put your grades on Brightspace!

**Assignment late submission policy:** Except for medical and family emergencies (accompanied by verification), there will be *no individual extensions* granted for programming assignments or the mini-project. 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.

**Regrade Requests:** If you believe that we have made an error in grading, please submit a regrade request that includes 1) your reasoning or explanation for a regrade and 2) a link to your GitHub repository to the following email address: [ece20875.purdue.university@gmail.com](mailto:ece20875.purdue.university@gmail.com). **All such requests must be made within one week of when the grade was posted.** Please note that during the regrading process, we reserve the right to regrade any portion of your submission.

### **Exams**

The first two exams will take place roughly during the 6th and 11th weeks of the semester, and the third exam will take place during finals period. Exams are equally weighted and are not cumulative.

Due to COVID-19, exams will be administered online. To accommodate multiple timezones, the exams will be offered several times during the day of the exam (final times are TBD). **During this 24 hr period, absolutely no contact with anyone in the course, including the teaching staff, is permitted.** Once you open the exam, you will have 1-2 hrs to complete it.

Missing an exam will result in a grade of 0 for that exam. Exam reschedules will only be granted if you demonstrate that it is absolutely necessary (accompanied by verification) and obtain written approval from one of the instructors in advance of the exam.

We will be using Gradescope ([www.gradescope.com](http://www.gradescope.com)) to administer the exams. Once you open the exam, you will print it out, and then scan it back to Gradescope (using Gradescope's smartphone app or other scanner) when you are finished. Additionally, we will require you to join a Zoom call that will be monitored by the teaching staff. Thus, **you must have access to a webcam, printer, and a smartphone/scanner.**

Your Purdue emails have been synced with the course Gradescope and you should have ECE 20875 listed in your account.

### Tentative Course Schedule

Below is a rough schedule of when and what will be covered in class:

Week	Topic(s) covered
<b>1</b> 1/18	<b>MLK day (Mon, Jan 18)</b> Introduction Python basics (variables, control structures, functions) Git basics
<b>2</b> 1/25	Python basics (continued) Python data structures (lists, tuples, associative arrays) Histograms
<b>3</b> 2/1	Histograms (continued) Probability distributions Random variables
<b>4</b> 2/8	Filters Map/reduce Higher-order functions
<b>5</b> 2/15	Sampling and estimation <b>Reading day (Wed, Feb 17)</b> Hypothesis testing Confidence intervals

Week	Topic(s) covered
<b>6</b> 2/22	<b>Exam 1 (Exact date TBD)</b> Hypothesis testing (continued) Confidence intervals (continued)
<b>7</b> 3/1	Regular expressions Basic text processing Bash scripting
<b>8</b> 3/8	Introduction to supervised learning Matrix algebra Regression and least squares
<b>9</b> 3/15	<b>Stress-free week (no assignments or exams due)</b> Regression (continued) Regularization <b>Reading Day (Thurs, March 18)</b> Cross validation
<b>10</b> 3/22	Regression (continued) n-grams Natural language processing
<b>11</b> 3/29	Objects and Classes Introduction to unsupervised learning Clustering: K-Means
<b>12</b> 4/5	<b>Exam 2 (Exact date TBD)</b> Clustering: GMMs Inheritance
<b>13</b> 4/12	Iterators and Generators <b>Reading day (Tues, April 13)</b> Classification: Naive Bayes
<b>14</b> 4/19	Classification: kNN Classification: Logistic regression
<b>15</b> 4/26	Introduction to deep learning Neural network architectures Conclusion
Finals 5/3-5/8	<b>Exam 3 (Date TBD)</b>

### 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 post or copy code!). If there is any doubt, please email the instructors.

**We will be using software designed to catch plagiarism in programming assignments and copying on exams. A student is considered in violation of the academic honesty policy regardless of whether they are the one “copying” or the one “being copied from.”**

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 of Students. On the first instance of cheating, students will receive a 0 on the assignment or exam; the second instance of cheating will result in a failure of the course.

### **Classroom Guidance Regarding Protect Purdue**

The Protect Purdue Plan, which includes the Protect Purdue Pledge, is campus policy and as such all members of the Purdue community must comply with the required health and safety guidelines. Required behaviors in this class include: staying home and contacting the Protect Purdue Health Center (496-INFO) if you feel ill or know you have been exposed to the virus, properly wearing a mask in classrooms and campus building, at all times (e.g., mask covers nose and mouth, no eating/drinking in the classroom), disinfecting desk/workspace prior to and after use, maintaining appropriate social distancing with peers and instructors (including when entering/exiting classrooms), refraining from moving furniture, avoiding shared use of personal items, maintaining robust hygiene (e.g., handwashing, disposal of tissues) prior to, during and after class, and following all safety directions from the instructor.

**Students who are not engaging in these behaviors (e.g., wearing a mask) will be offered the opportunity to comply. If non-compliance continues, possible results include instructors asking the student to leave class and instructors dismissing the whole class.** Students who do not comply with the required health behaviors are violating the University Code of Conduct and will be reported to the Dean of Students Office with sanctions ranging from educational requirements to dismissal from the university.

Any student who has substantial reason to believe that another person in a campus room (e.g., classroom) is threatening the safety of others by not complying (e.g., not wearing a mask) may leave the room without consequence. The student is encouraged to report the behavior to and discuss next steps with their instructor. Students also have the option of reporting the behavior to the Office of the Student Rights and Responsibilities. See also Purdue University Bill of Student Rights.

**If you feel ill, have any symptoms associated with COVID-19, or suspect you have been exposed to the virus, you should stay home and contact the Protect Purdue Health Center (496-INFO).** In the current context of COVID-19, in-person attendance will not be a factor in the final grades, but the student still needs to inform the instructor of any conflict that can be anticipated and will affect the submission of an assignment or the ability to take an exam. When conflicts can be anticipated, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency conflict, when advance notification to an instructor is not possible, the student should contact the instructor as soon as possible by email. When the student is unable to make direct contact with the instructor and is unable to leave word with the instructor's department because of circumstances beyond the student's control, and in cases of bereavement, quarantine, or isolation, the student or the student's representative should contact the Office of the Dean of Students via email or phone at 765-494-1747. Our course Brightspace includes a link on Attendance and Grief Absence policies under the University Policies menu.

### **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.

### **Nondiscrimination Statement**

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. More details are available on our course Brightspace table of contents, under University Policies.

### **Accessibility**

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: [drc@purdue.edu](mailto:drc@purdue.edu) or by phone: 765-494-1247. More details are available on our course Brightspace under Accessibility Information.

### **Mental Health Statement**

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try WellTrack. Sign in and find information and tools at your fingertips, available to you at any time.

If you need support and information about options and resources, please contact or see the Office of the Dean of Students. Call 765-494-1747. Hours of operation are M-F, 8 am-5 pm.

If you find yourself struggling to find a healthy balance between academics, social life, stress, etc. sign up for free one-on-one virtual or in-person sessions with a Purdue Wellness Coach at RecWell. Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is completely free and can be done on BoilerConnect. If you have any questions, please contact Purdue Wellness at [evans240@purdue.edu](mailto:evans240@purdue.edu).

If you're struggling and need mental health services: Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS office of the second floor of the Purdue University Student Health Center (PUSH) during business hours.

### **Disclaimer**

This syllabus is tentative and is subject to change. Any substantive changes will be announced in class and on Piazza.