Course Information

- **Course Number:** HONR 490
- **Course Name:** Foundations of Geospatial Analytics: Mapping and Analyzing Our World
- **Semester:** Fall 2021
- **Meeting Location, Day(s), and Time:** INSERT
- **Instructional Modality:** Face-to-Face
- **Course Credit Hours:** 1
- **Prerequisites:** Working knowledge of Python and an understanding of SQL
    - We will be using PostGIS, and the SQL can get fairly complex. An understanding of SQL is recommended. The first week of the course will serve as a review; however, coming into the course, you should know the differences between the types of JOINs, how to use nested queries, and how to use subqueries in SELECT statements.

Instructor Contact Information

- **Name of the Instructor:** Justin Gould
- **Office Location:** Convergence Center
- **Purdue Email Address:** gould29@purdue.edu
    - Emails are read 7:00 to 17:00 EST during school days, and will be responded to within 24 hours.
    - I receive many emails during the day. It will really help me find your email if you put our class number in the subject line of the email. Thank you in advance!
- **Scheduling Time with Instructor:** https://calendly.com/gould29
    - If you are unable to make my office hours, please schedule a time with me via Calendly (link above). We can meet in my office, virtually via WebEx, or even take a walk around campus.
- **Office Hours:**
    - My dedicated office hours will be:
        - Wednesdays: 9:00-9:50 EDT/EST
        - Fridays: 8:30-9:20 EDT/EST
- **Course Co-Sponsor:** Mark Daniel Ward
- **Course Co-Sponsor Email:** mdw@purdue.edu
- **Course Co-Sponsor Office:** Hillenbrand Hall

Course Description

Maps are everywhere around us: in our cars, on our phones, and driving public health initiatives. Geospatial skills and knowledge are increasingly sought after in industry, and will continue to prove vital to Data Science. You will learn how to create maps and analyze spatial data using Python and SQL, how spatial data are applied in a variety of domains, and have hands-on experiences with real data. Together, we will answer questions such as: (1) what are maps, (2) how can we create maps from data, (3) and how do we quantify and analyze maps. Applied geospatial projects will include: autonomous vehicles, public health, supply chain, and more.

Learning Resources, Technology, & Texts

- Required Textbook:
  - Obe, Regina O., and Leo S. Hsu. PostGIS in Action. 3rd ed., Manning, 2021.
    - Free Ebook: https://livebook.manning.com/book/postgis-in-action-third-edition/welcome/v-14/
    - Purchase: https://www.manning.com/books/postgis-in-action-third-edition?a_bid=5e00124f&a_aid=PostGISInAction
- Software:
  - Laptop (either MacOS or Windows is fine)
  - Python >= 3.6.x & < 3.9.x: https://www.python.org/downloads/
  - QGIS 3.16: https://www.qgis.org/en/site/forusers/index.html
  - PostGIS >= 3.1.0: https://postgis.net/install/
- Tutoring Support:
  - Visit Ask a Librarian to connect with helpful resources and services provided by the Purdue Libraries and School of Information Studies for course assignments and projects.
- Brightspace:
  - Access the course via Purdue's Brightspace learning management system. It is strongly suggested that you explore and become familiar not only with the site navigation but with content and resources available for this course.

Learning Outcomes

By the end of the course, you will be able to:

1. Identify...
   i. Features, attributes, and data that make up maps
   ii. Qualities of effective maps
   iii. Methods of Evaluation: homework assignments
2. Demonstrate...
   i. Visualizing maps via Python and QGIS
   ii. Quantifying map features and engineering new map attributes/inferring knowledge from map data
   iii. Applying geospatial analysis techniques on real-world tasks
   iv. Methods of Evaluation: projects and homework assignments
3. Develop...
   i. Your own maps and map databases from spatial and non-spatial data
   ii. Methods of Evaluation: projects and homework assignments

Assignments

Assignments	Due	Points
Homework (Interactive Labs/"Notebook"-Style Assignments)	23:59 EST/EDT the day before our class; ongoing	240
Midterm Project	10/10 at 23:59 EDT	300
Final Project	12/12 at 23:59 EST	460
TOTAL		1000

- Homework (12 assignments at 20 points each, for a total of 240 points; ongoing, but due at 23:59 EST/EDT the day before our class). These will be interactive assignments, such as Jupyter notebooks, or .py files which must pass a series of unit tests. Grades will be provided based on passing unit tests, accuracy, and completing the assignment, per the provided instructions.
- Midterm project (300 points; due October 10 at 23:59 EDT). Details about this project are in Brightspace under Assignments, including the grading rubric. A presentation will be given in class on October 18.
- Final project (460 points; due December 12 at 23:59 EST). Details about this project are in Brightspace under Assignments, including the grading rubric. A final presentation will be given in class during finals week.

Makeup Work and Due Dates

I want to see you learn, grow, succeed, and come to love geospatial analytics as much as I do. It is your responsibility to turn in all work and projects before the due date. With that being said, life happens, and flexibility is sometimes required—especially during the COVID-19 pandemic. That is OK! If you are having any issues with the assignments or projects, which may mor may not impact your ability to submit by the due date, please email me ASAP. We will work together to come up with an amicable solution. Please see below for makeup work policies:

- **Homework**: If you miss a due date, and I do not hear from you before the prescribed due date, you will receive a 0 for that assignment, and there will be no makeup work available.
- **Projects**: If you miss a due date, and I do not hear from you before the prescribed due date, your project portion of the grade (**not** the presentation portion) will reduce 100 points every day the project is not submitted.

Grading Scale

In this class, grades reflect the sum of your achievement throughout the semester. You will accumulate points as described in the assignments portion above. At the end of the semester, final grades will be calculated by adding the total points earned and translating those numbers (out of 1000) into the following letters (there will be no partial points or rounding).

Grade	Points Earned
A+	965-1000
A	940-964
A-	900-939
B+	865-899
B	840-864
B-	800-839
C+	765-799
C	735-764
C-	700-734
D+	665-699
D	635-664
D-	600-634
F	<=599

Attendance Policy during COVID-19

Students are expected to attend all classes in-person 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 at (765) 496-INFO. **If this applies to you, do not—under any circumstances—come to class.**

In the current context of COVID-19, **in-person attendance cannot be a factor in the final grades**. However, timely completion of alternative assessments can certainly be part of the final grade. 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.

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. 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.

Academic Guidance in the Event a Student is Quarantined/Isolated

If you must quarantine or isolate at any point in time during the semester, please reach out to me via email so that we can communicate about how you can continue to learn remotely. Work with the Protect Purdue Health Center (PPHC) to get documentation and support, including access to an Academic Case Manager who can provide you with general guidelines/resources around communicating with your instructors, be available for academic support, and offer suggestions for how to be successful when learning remotely. Your Academic Case Manager can be reached at acmq@purdue.edu. Importantly, if you find yourself too sick to progress in the course, notify your academic case manager and notify me via email or Brightspace. We will make arrangements based on your particular situation.

Course Schedule*

Week	Date	Topic(s)	Assignment(s) Due
Week 1	August 23	• Welcome! • Review Python and SQL	• N/A

Week 2	August 30	• What are maps?
		  ○ Map design principles
		• Basic map creation and visualization
		  ○ Preprocessing spatial data
		  ○ Python and QGIS
			• HW #1 due 08/29 23:59 EDT

Week 3	September 06	• Basic map creation and visualization
		  ○ Preprocessing spatial data
		  ○ Python and QGIS
			• HW #2 due 09/05 23:59 EDT

Week 4	September 13	• Introduction to PostGIS ○ Basic map manipulation	• HW #3 due 09/12 23:59 EDT
Week 5	September 20	• Advanced PostGIS	• HW #4 due 09/19 23:59 EDT
Week 6	September 27	• Using Spark for geospatial analysis	• HW #5 due 09/26 23:59 EDT
Week 7	October 04	• Midterm project: public health	• Midterm presentation during class • HW #6 due 10/03 23:59 EDT
Week 8	October 11	• Midterm project: public health	• Midterm project due 10/10 23:59 EDT • Midterm presentation during class • HW #7 due 10/10 23:59 EDT
Week 9	October 18	• Map feature engineering ○ Python and PostGIS	• N/A
Week 10	October 25	• Using "dirty" spatial data ○ Map matching algorithms	• HW #8 due 10/24 23:59 EDT
Week 11	November 01	• Using "dirty" spatial data ○ Map matching algorithms	• HW #9 due 10/31 23:59 EDT
Week 12	November 08	• Routing and optimization	• HW #10 due 11/07 23:59 EST
Week 13	November 15	• Class time to work on final project	• HW #11 due 11/14 23:59 EST
Week 14	November 22	**NO CLASS – THANKSGIVING BREAK**	• HW #12 due 11/21 23:59 EST
Week 15	November 29	• Class time to work on final project	• Final project proposal due 11/28 23:59 EST
Week 16	December 06	• Semester wrap-up • Final project: autonomous vehicles	• Final presentation during class
Finals Week	December 13	• Final project: autonomous vehicles	• Final project due 12/17 23:59 EST • Final presentation during class

* Schedule and assignments subject to change. Any changes will be posted in the learning management system. See https://www.purdue.edu/registrar/calendars/2021-22-Academic-Calendar.html for important semester dates.

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 (765) 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 before 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 properly wearing a mask) may leave the room without consequence. The student is encouraged to report the behavior to and discuss the 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.

Academic Integrity

The instructor fully expects all students to follow Purdue's Honor Pledge: "As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue."

integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling (765) 494-8778. While information may be submitted anonymously, the more information is submitted the greater the opportunity for the university to investigate the concern. More details are available on our course Brightspace table of contents, under University Policies.

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 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. You can find Purdue's full Nondiscrimination Policy Statement here: https://www.purdue.edu/purdue/ea_eou_statement.php.

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 or by phone: (765) 494-1247.

Mental Health/Wellness 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, 8:00 – 17:00 EST.

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.

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 on the second floor of the Purdue University Student Health Center (PUSH) during business hours.

Emergency Preparation

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. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your @purdue.edu email on a frequent basis. For more information, please see the Emergency Preparedness Safety Briefing.

Related Considerations and Guidelines

1. If you experience any symptoms of COVID-19, or suspect you may have been exposed to someone with COVID-19, stay home and call the Protect Purdue Health Center at (765) 496-INFO.
2. Keep your cell phone on to receive a Purdue ALERT text message.
3. Log into a Purdue computer connected to the network to receive any Desktop Popup Alerts.