

GTECH 38518/78518 – Environmental Data Science
Fall 2021 (Hybrid)
Tuesday 5:35 p.m. to 8:25 p.m.

Contact Information

Instructor:	Dr. Wenge Ni-Meister
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Office:	HN1029
Office Phone	212-772-5321
Office hours	Tuesday: 4:30pm-5:30pm or by appointment
Depr. Information	HN1006

Prerequisites: GTECH20100/70900 An introductory statistics course is strongly recommended. Background in remote sensing is a plus but not required. You can also take GTECH 32100/71200 concurrently with this course.

Required textbook None. We will use all online materials.

Course Description: 3 credits/3 hours.

Data science is an emerging interdisciplinary field that combines mathematics, statistics, computer science, and knowledge in a particular application domain to extract meaningful information from the increasingly sophisticated array of publicly available data.

Scientific methods for environmental science are changing due to the advanced data acquisition technology and data science computing methods. This course offers students the opportunity to learn the latest data science computing and visualization methods through processing and interpreting large-scale publicly available environmental datasets, particularly remote sensing data. Students will learn how to use open-source software to analyze spatial data science problems.

Students will use Python to explore, visualize and analyze large spatio-temporal environmental data available from various environmental data networks. Students learn how to use the top Python Libraries for Data Science: Pandas, NumPy, SciPy, Matplotlib, Seaborn, Scikit Learn, Xarray, Geopandas, GDAL, Rasterio, Rioxarray, and hvplot to visualize and analyze environmental data. The first half of the semester covers the basic python data science libraries. The second half focuses on learning about and processing geospatial data and dynamic data query and machine learning algorithms. Students will develop individual or group projects for final projects.

Course Objectives and Learning Outcomes: Upon successfully completing this course, students will gain various skills in programming and conducting scientific research. More specifically, students will be able to

- **Gather and organize** data programmatically using Python for deeper analysis.
- **Analyze** the trends and **discover** patterns in the data and **extract** conclusions.
- **Model** complex phenomena and **predict** future trends, and **use** data to **automate decisions**.
- **Display** information visually and **communicate** your findings in a clear and compelling way.

Grading:

Lab exercises	50%
Mid-term	10%
Final Exam/Final project	40%

Lab exercises consist of conceptual questions requiring written responses as well as computational questions requiring coding in Python. **Late work will be accepted with a 10% penalty for each day.**

The mid-term will be open-book and an in-class and take-home exam focusing on writing basic python code. **Graduate and undergraduate students will be given different exams.**

The final project is a term project that students should complete and **present** at the end of the semester. It must be centered around analyzing environmental data using python programming skills learned in class. Graduate students are expected to do much more comprehensive final projects than undergraduate students. Different grading systems will be used for undergraduate and graduate students.

All required work needs to be submitted through BB. I do not take any submissions by email.

Grading Policy

Grading will follow Hunter College policy as outlined in the latest online undergraduate and graduate catalogs that can be found **at <http://catalog.hunter.cuny.edu/>**

I do not give incompletes (IN) except under the most extraordinary and documented circumstances. You must contact me within 48 hours of the final exam and request IN as a grade. At that time undergraduates will schedule a date to meet with me at the college and complete a Contract to Resolve Incomplete Grades. Otherwise, I will average the grades I have for you and record the grade you have earned.

If you miss the final exam, you must (1) contact me within 48 hours of the missed exam, (2) present acceptable documentary evidence for your absence, and (3) be available for the make-up exam (Note: there will be one make-up exam day at the end of the semester held outside of class for those eligible). A make-up exam covers the same material as the regular exam but will not be the same exam given as scheduled. (i.e. DON'T MISS AN EXAM).

Only undergraduate students are eligible for credit/no credit (C/NC) as a final course grade. Please see the college's policy on C/NC at **<http://catalog.hunter.cuny.edu/content.php?catoid=37&navoid=10489>**. You must meet submit your CR/NC form, in person, no later than 15 minutes before the final presentation period.

Resources

- All class material will be posted on Bb.

Essential Policy Information:

- Attendance/lateness policy: It is extremely important to attend the regular classes and take detailed notes. Students who attend classes regularly are much more successful than those who are not.

- Email Policy
 - Please use GTECH 38518/78518 Environmental Data Science in the subject line when you email me. I do not answer emails with insufficient subject lines.
 - Email me from your @myhunter account, not your personal email address.
 - Please sign your full name as it appears in CUNYfirst to any message. I do not answer unsigned email messages.
 - Students' emails will be responded to within 24 hours. Please note there will be a delay for messages sent over the weekend or during non-business hours.

Hunter College Statement on Academic Integrity

Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures. Plagiarism, dishonesty, or cheating in any portion of the work required for this course will be punished to the full extent allowed according to Hunter College regulations.

ADA Policy

In compliance with the American Disability Act of 1990 (ADA) and with Section 504 of the Rehabilitation Act of 1973, Hunter College is committed to ensuring educational parity and accommodations for all students with documented disabilities and/or medical conditions. It is recommended that all students with documented disabilities (Emotional, Medical, Physical, and/or Learning) consult the Office of AccessABILITY, located in Room E1214B, to secure necessary academic accommodations. For further information and assistance, please call: (212) 772- 4857 or (212) 650-3230.

Hunter College Policy on Sexual Misconduct

In compliance with the CUNY Policy on Sexual Misconduct, Hunter College affirms the prohibition of any sexual misconduct, which includes sexual violence, sexual harassment, and gender-based harassment retaliation against students, employees, or visitors, as well as certain intimate relationships. Students who have experienced any form of sexual violence on or off campus (including CUNY-sponsored trips and events) are entitled to the rights outlined in the Bill of Rights for Hunter College.

- a. Sexual Violence: Students are strongly encouraged to immediately report the incident by calling 911, contacting NYPD Special Victims Division Hotline (646-610-7272) or their local police precinct, on contacting the College's Public Safety Office (212-772-4444)
- b. All Other Forms of Sexual Misconduct: Students are also encouraged to contact the College's Title IX Campus Coordinator, Dean John Rose (jtrose@hunter.cuny.edu or 212-650-3262) of Colleen Barry (colleen.barry@hunter.cuny.edu or 212-772-4534) and seek complimentary services through the Counseling and Wellness Services Office, Hunter East 1123.

CUNY Policy on Sexual Misconduct Link: <http://www.cuny.edu/about/administration/offices/la/Policy-on-Sexual-Misconduct-12-1-14-with-links.pdf>

Syllabus Change Policy

- Except for changes that substantially affect the implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advance notice.
- Any changes will be updated through Bb.

Tentative Daily Schedule

Week	Date	Lectures /Labs	
Week 1	8/31/2021	Introduction to Data Science and Jupyter Notebook	In-person
	9/7/2021	No Classes scheduled	
Week 2	9/14/2021	Basic Python	Online
Week 3	9/21/2021	Pandas	In-person
Week 4	9/28/2021	Matplotlib/Seaborn/Hvplot	Online
Week 5	10/5/2021	Numpy	In person
Week 6	10/12/2021	Xarray	Online
Week 7	10/19/2021	Object-Oriented Programming	In-person
Week 8	10/26/2021	Midterm Exam	Online
Week 9	11/2/2021	GeoSpatial Fundamental Geopanda and GDAL	In-person
Week 10	11/9/2021	GeoSpatial Fundamental Rasterio, Rioxarray	Online
Week 11	11/16/2021	Dynamic Data Query	In person
Week 12	11/23/2021	Processing Lidar Data	Online
Week 13	11/30/2021	Machine Learning	In-person
Week 14	12/7/2021	Final Project Preparation	Online
	12/14/2021	Reading day	
Week 15	12/21/2021	Final Project Presentation	In-person