

GISC 4381/6321: Spatial Data Science

Professor Contact Information

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Office Hours: Wednesdays 2-4 pm or by appointments

TA Contact Information

TBA.

Course Description

Data science has emerged as one of the key drivers of societal transformation. Many data have intrinsic spatial properties (e.g., locations, geometry, and boundary) and subsequent relationships and interactions in space and time. Such spatial data are critical to find solutions or develop applications for emergency management, environmental sustainability, public health, smart city, public safety, business logistics, driverless cars, ecological conservation, and many other problem domains. This course aims to help students develop knowledge and skills to ask spatial questions, find, process and analyze spatial data, solve spatial problems, and communicate their findings. Specifically, the course will introduce spatial data analytics and machine learning methods. Central to the course is learning how to think through spatial problems and formulate solutions in spatial data science frameworks. How can we leverage spatial properties of data to advance our understanding of the roles, functions, and processes of location, space, and place on the society, environment, and their interactions? How does spatiality provide efficient frameworks to organize information, conceptualize real-world problems, and innovate solutions? Technically, we will explore machine learning with ArcGIS and proceed with open-source Python libraries (e.g., pandas, geopandas, scipy, stats, scikitlearn, and if time permits, keras and tensorflow).

Student Learning Objectives/Outcomes

1. Knowledge: define spatial data science and its relations to spatial data science
2. Skills: fundamental tools and methods to process and analyze spatial data
3. Application: understand application principles to develop spatial data workflows to solve real-world problems through hands-on project packages

Course schedule: Subject to modifications

Date	Topic	
Aug 26	Introduction to Spatial Data Science for problem solving	
Sept 02	Get to know data and think about how the data can be useful with ArcGIS pro	
Sept 09	Get to know data and think about how the data can be useful with Python	Package 1 due 9/15 midnight
Sept 16	Questions that find and extract objects of interest	
Sept 23	Questions that aim to summarize observations	

Sept 30	Questions that seek patterns and organizations	Package 2 due 10/6 midnight
Oct 07	Questions that look for relationships	
Oct 14	Questions that use relationships	
Oct 21	Questions that inquire associations	
Oct 28	Questions that seek explanations	Package 3 due 11/3 midnight
Nov 04	Questions that project what is likely ...	
Nov 11	Questions that address what can be ...	
Nov 18	Questions that ask what if ...	
Nov 25	Thanksgiving break, no class	Package 5 due 12/01 midnight
Dec 02	Research project presentations (graduate students only; undergraduate students need to attend the presentations)	
Dec 09	Final Exam	

Grading Policy

No Curved

93-100 points = A; 90-92 points = A-
87-89 points = B+; 83-86 points = B; 80-82 points = B-
77-79 points = C+; 73-76 points = C; 70-72 points = C-
67-69 points = D+; 63-66 points = D; 60-62 points = D-
59 and below = F

A package is an ensemble of exercises and questions for each topical section of the class. We have five packages in the class. Each package has a maximum of 100 points.

For undergraduate credits:

- All packages together count 70%
- Final exam counts 30%
- Graduate plus questions: bonus 10%

Late submissions: A penalty of 10% deduction for a delay of every two hours on all assignments.

Course & Instructor Policies

Class attendance is expected. No make-up exams or assignments except for medical reasons, family emergencies or official university responsibilities. Class materials will be distributed on our class elearning website. All assignments should be submitted to the class elearning site. There will be no paper handouts and submissions in the class.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

“As a Comet, I pledge honesty, integrity, and service in all that I do.”

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University’s policies and procedures segment of the course syllabus.

Please go to <http://go.utdallas.edu/syllabus-policies> for these policies.

It is the policy and practice of The University of Texas at Dallas to make reasonable accommodations for students with properly documented disabilities. However, written notification from the Office of Student AccessAbility (OSA) is required. If you are eligible to receive an accommodation and would like to request it for this course, please discuss it with me and allow one week advance notice. Students who have questions about receiving accommodations, or those who have, or think they may have, a disability (mobility, sensory, health, psychological, learning, etc.) are invited to contact OSA for a confidential discussion. OSA is located in the Student Services Building, SSB 3.200. They can be reached by phone at 972-883-2098, or by email at studentaccess@utdallas.edu.

UT Dallas Policies on Carry of Concealed Handguns is available at <http://www.utdallas.edu/campuscarry/policy.pdf>

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.