

GEOG 4/590: Geospatial Data Science

Lecture 1: Introduction



Welcome

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- BSc in Geography at University of Nottingham, UK
- MPhil in Polar Studies at University of Cambridge, UK
- PhD in Geography at Aberystwyth University, UK
- Postdoc at the Institute at Brown for Environment and Society, RI, USA

- Researching glaciology, hydrology, remote sensing

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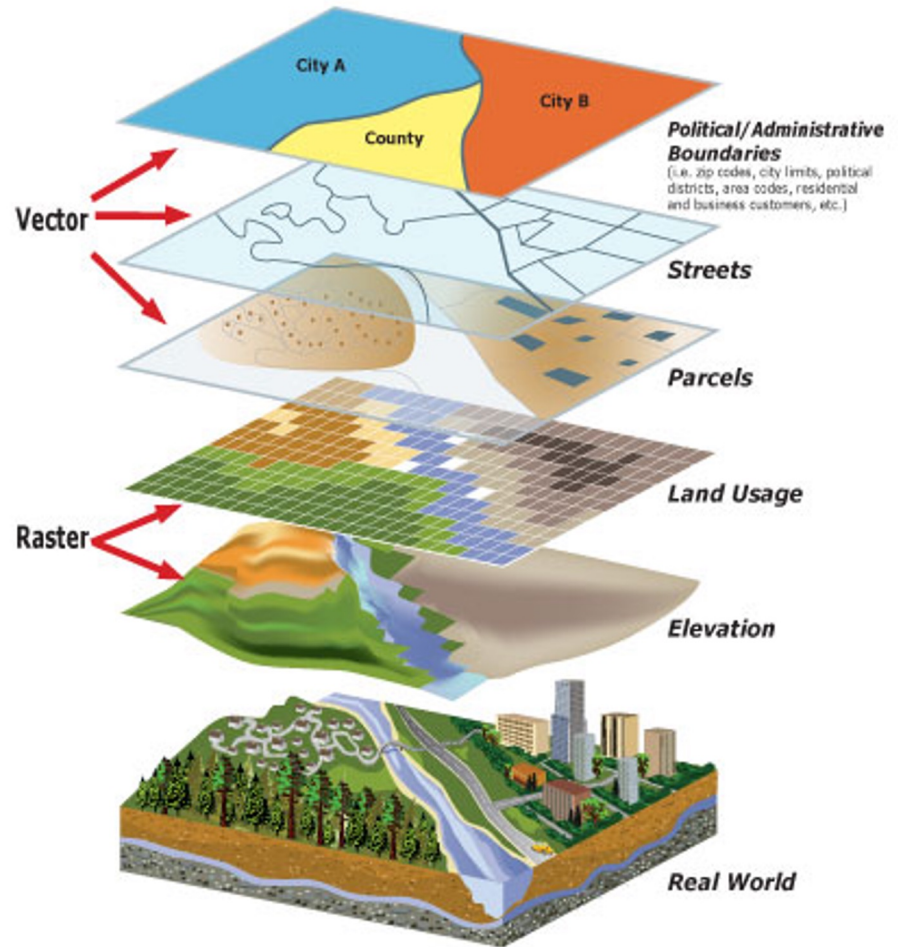
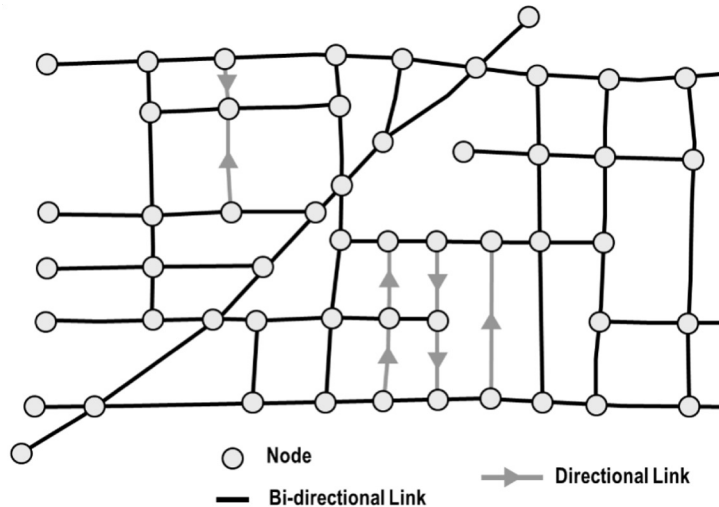
Office hours: Monday 15:00-16:00 and Tuesday 14:00-15:00

Overview

- What is Geospatial Data Science?
 - Spatial data (e.g. geometries and projections)
 - Coding (e.g. Python)
 - Collaborating (e.g. GitHub)
- Course schedule
 - Lectures, labs, grading
- Final project
- Some tasks
 - Complete background survey on Canvas
 - Getting started in Fridays lab session

Geospatial data

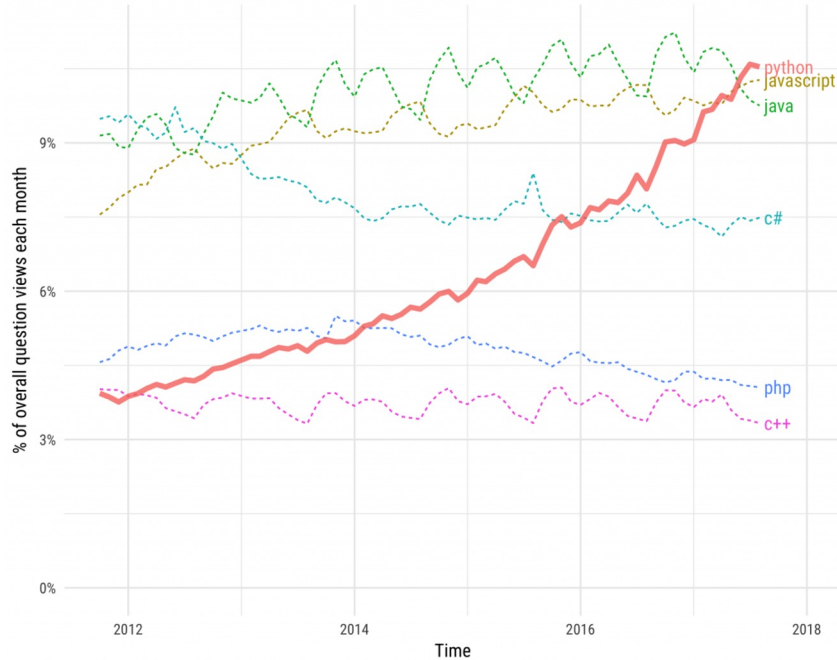
- Vector data
- Network data
- Raster data



Python

Growth of major programming languages

Based on Stack Overflow question views in World Bank high-income countries



- Popular high-level programming language
- Easy-to-read
- Extensive and mature libraries
- Free and open-source
 - Accessible
 - Can be examined, modified, and improved
- Constantly evolving



Git and GitHub



- Git
 - **Version control** software for tracking changes to a set of files
- GitHub
 - A cloud-based Git repository hosting service
 - Makes it easier to coordinate work among programmers collaboratively developing source code during software development
- Python and projects that use Python (e.g. matplotlib) are all maintained and developed by a community of scientists and programmers on GitHub
- An active, up-to-date GitHub profile, with contributions to open-source project is a great way to provide evidence of skills




Course schedule

- **Lectures:** Monday 2pm in 471 MCK
 - Eight lectures
 - Holiday on Jan 16
- **Labs:** Thursday @ 10am or Friday @ noon in 445 MCK
 - Seven labs
 - Two labs to concentrate on final project
 - Class presentations in Week 10

Course evaluation


- Lab assignments (45%) due every **Friday 11:59 pm**
- Final project (45%)
 - Presentations due **March 13, 11:59 pm**
 - Write-ups due **March 17, 11:59pm**
- Participation (10%)
 - Credit can be earned through attendance in lectures, participation in class discussion (both virtual and in-person), visiting Professor and GE during office hours, and helping other students in labs.

Week	Date	Lecture x 1 hour	Lab x 2 hours	Project
1	Jan 9	Introduction	Assignment 1	
2	Jan 16	Vector data analysis	Assignment 2	
3	Jan 23	Network data analysis	Assignment 3	
4	Jan 30	Gridded data analysis	Assignment 4	
5	Feb 6	Machine learning	Assignment 5	Submit project ideas
6	Feb 13	Code management	Assignment 6	Initialize project
7	Feb 20	Data access	Assignment 7	
8	Feb 27	Visualization	Project work	Project check-in
9	Mar 6	Discussion	Project work	
10	Mar 13	Project presentations		Submit project write-up



Working with
geospatial data

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Working with
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Machine learning

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Working with
geospatial data

Machine learning

Key skills

Final project

- An opportunity to explore a particular topic of interest using some of the skills developed in this course
- Students can work independently or in groups of two or three
- Sharing of project ideas is encouraged so we can form teams

Final project schedule

- **Week 5:** Discuss project ideas with peers and instructors, submit a short summary of a project idea to instructor via Canvas
- **Week 6:** Form teams, create GitHub repo, and provide some basic info about project as a README.md
- **Week 8:** Provide informal update to instructors, ensure data has been accessed, goals are accomplishable
- **Week 10:** Present project to class and submit write-up by the end of the week

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I will send reminders out about upcoming milestones

Get to know your neighbours!

- Please introduce yourself with your:
 - name
 - year
 - where you're from
 - favourite place to eat in Eugene

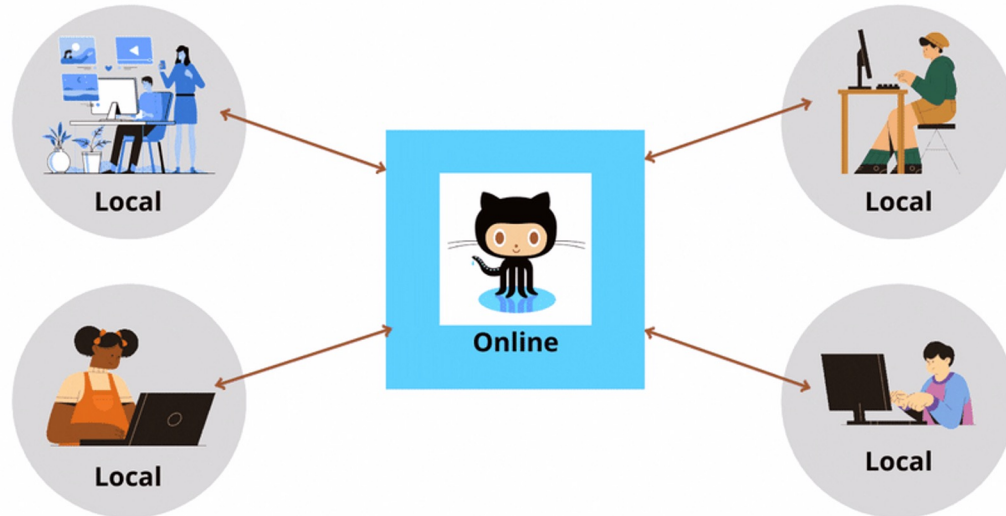
Some course themes

- Everything is open-source
 - All software we use is freely available
 - Labs can be completed anytime, anywhere from any OS
 - Course materials are publicly-available on the internet



Some course themes

- Promote collaboration and communication
 - With instructors **and** peers
 - On GitHub



Some course themes

- Learn about environmental challenges in the Western US
 - Urban planning and zoning
 - Hazards (e.g. wildfires, flooding)
 - Energy, climate, hydrology



Some course themes

- Don't try and write perfect code, if it works, it works
- It's not always necessary to write code, adapting code is quite normal
- Make use of stackoverflow
- Don't be afraid to ask (peers or instructors)

when stack overflow doesn't help solve your problems



Some course themes

- Take responsibility for learning
- Organize your files
- Check Canvas regularly
- Maintain your GitHub profile and repository



Some course themes

Learn by **DOING**.



By the end of this course you will...

- Have confidence using Python specifically for GIS and other geospatial data science applications
 - In doing so, you will also be comfortable using Python for other things as well
- Be able to download, process, analyze, and visualize the main types of geospatial data
- Automate boring GIS tasks (no more clicking!)

By the end of this course you will...

- Improve programming skills
- Learn how think computationally and statistically
- Solve real-world problems using spatial analysis
- Run basic machine learning models
- Manage a data science project using version control
- Collaboratively develop a data science project
- Communicate results of data science project orally and as a short write-up

Careers



200+ companies hiring for geospatial data science roles

Link to article on LinkedIn (with more details):

<https://www.linkedin.com/pulse/running-list-200-companies-hiring-geospatial-roles-ali-ahmadalipour/> In this article, I will provide a list of companies that hire technical roles focused on geospatial and climate-tech. Most of the...

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Getting started on this week's lab

- Go to course page:
 - <https://owel-lab.github.io/gds-applications-site/intro.html>
 - Also see Canvas for links

