GEOG 4/590: Geospatial Data Science

Lecture 1: Introduction

Welcome

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- 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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Overview

- What is Geospatial Data Science?
  - Spatial data (e.g. geometries and projections)
  - Coding (e.g. Python)
  - Collaborating (e.g. GitHub)

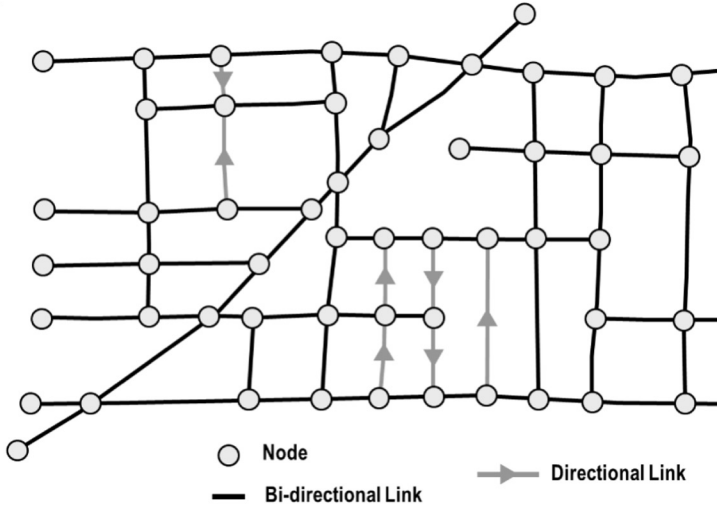
- Course schedule
  - Lectures, labs, grading

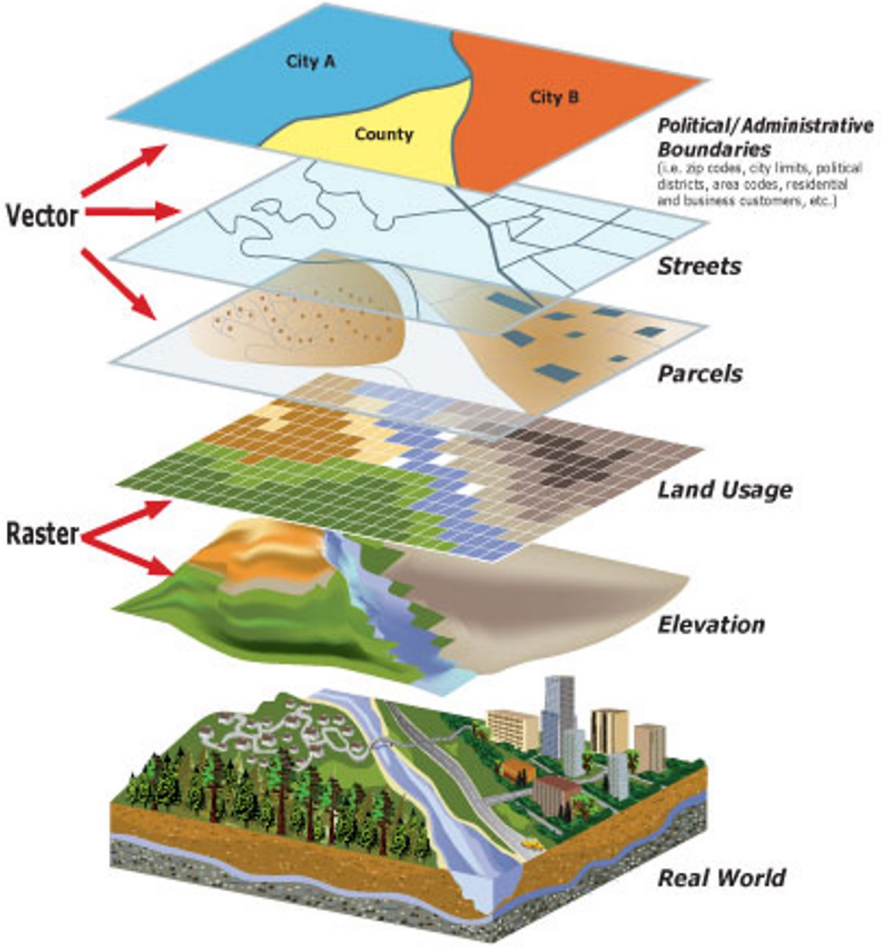
- Final project

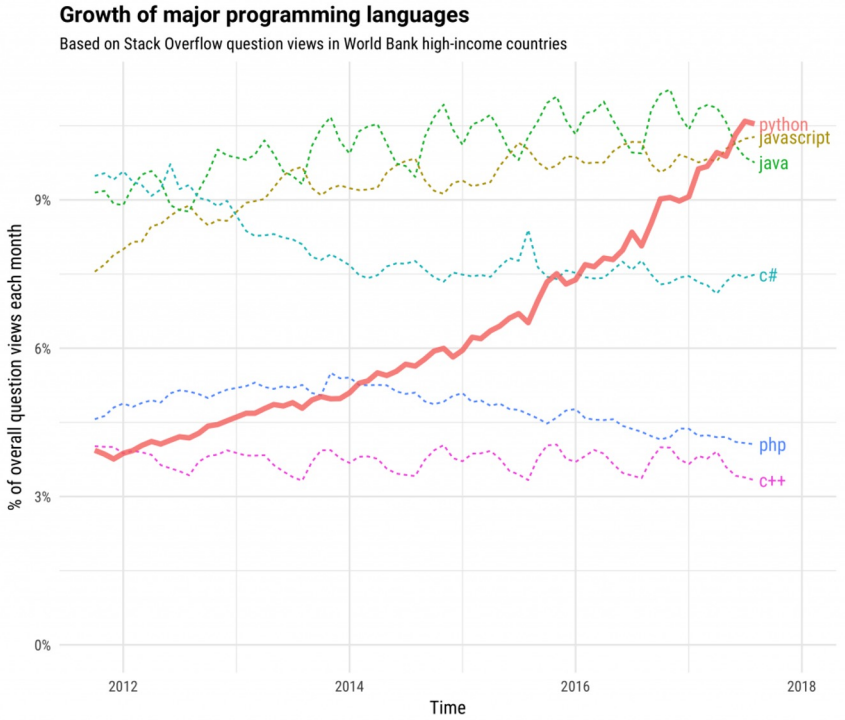
- Some tasks
  - Complete background survey on Canvas
  - Getting started in Wednesdays lab session

Geospatial data

- Vector data
- Network data
- Raster data







Python

- 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:** Tuesday @ 9am in 203 CON
  - Nine lectures
  - Project presentations in Week 10

- **Labs:** Wednesday @ 9am in 442 MCK
  - Seven lab assignments
  - Two labs to concentrate on final project
  - No lab in Week 10

- **Activities/project work:** Thursday @ 9am in 203 CON
  - Three activities
  - One lecture about previous class projects
  - Five sessions for project work
  - Project presentations in Week 10

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Course evaluation

- Lab assignments (45%) due every **Wednesday 11:59 pm**

- Final project (45%)
  - Presentations due **May 31, 11:59 pm**
  - Write-ups due **June 6, 11:59pm**

- Participation (10%)
  - Credit can be earned through attendance in lectures, visiting Professor and GE during office hours, and helping other students in labs/activities.

Course schedule

Week	Date	Lecture x 1 hour	Lab x 2 hours
Unit 1: Analyze			
1	Apr 2	**Introduction**	Assignment 1
	Apr 4	Check-in	
2	Apr 8	**Vector data**	Assignment 2
	Apr 11	Activity	
3	Apr 16	**Network data**	Assignment 3
	Apr 18	Activity	
4	Apr 23	**Gridded data**	Assignment 4
	Apr 25	Activity	

Course schedule

Week	Date	Lecture x 1 hour	Lab x 2 hours
Unit 2: Develop			
5	Apr 30	**Machine learning**	Assignment 5
	May 2	Submit project ideas	
6	May 7	**Code management**	Assignment 6
	May 9	Initialize project	
7	May 14	**Data access**	Assignment 7
	May 16	Work on project	
8	May 21	**Visualization**	Project work
	May 23	Project check-in	

Course schedule

Week	Date	Lecture x 1 hour	Lab x 2 hours
Unit 3: Communicate			
9	May 28	**Careers (guest lecture)**	Project work
	May 30	Work on project	
10	Jun 4	Project presentations	No lab
	Jun 6	Project presentations	
Final project write-ups due Jun 6 11:59pm			

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!

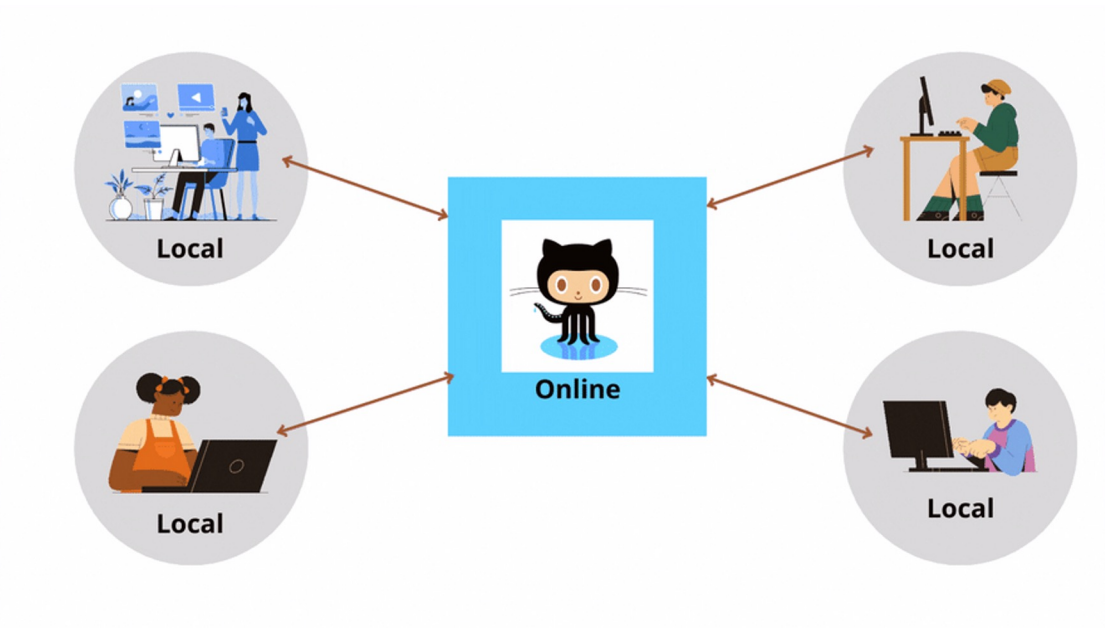
- Please introduce yourself with your:
  - name
  - year
  - where you're from
  - favourite place to eat in Eugene

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

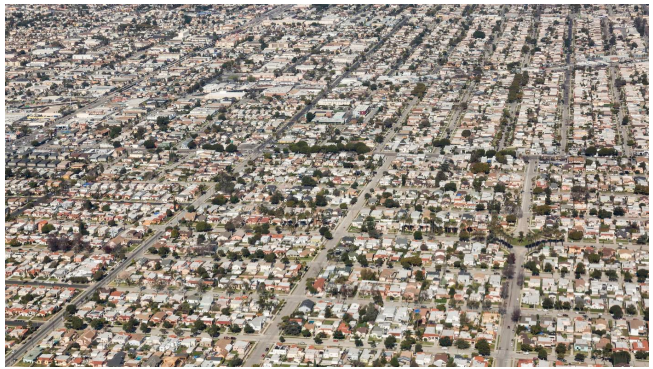
Some course themes

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



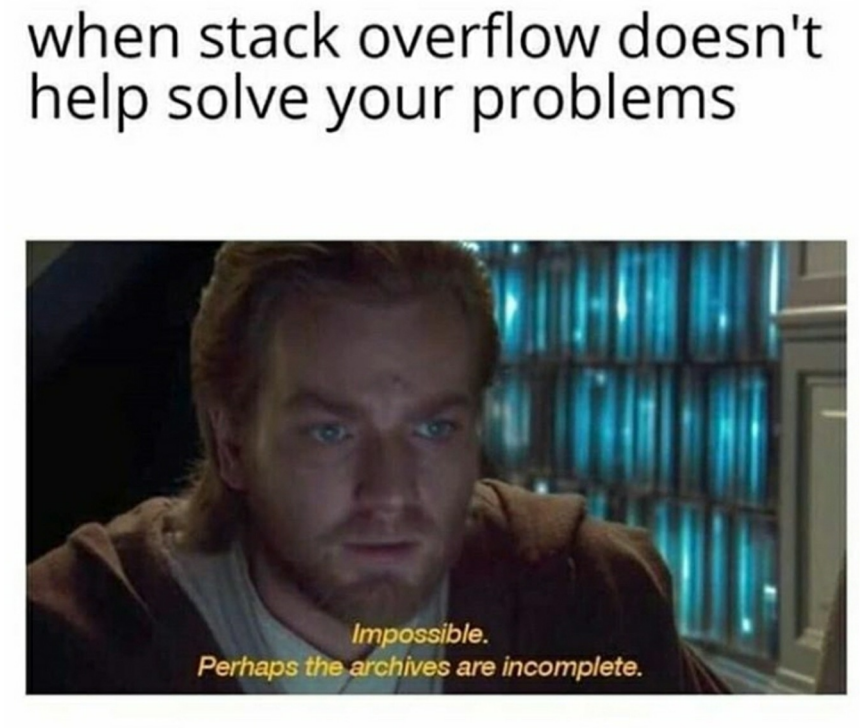
Some course themes

- 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)



Some course themes

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

Some course themes

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

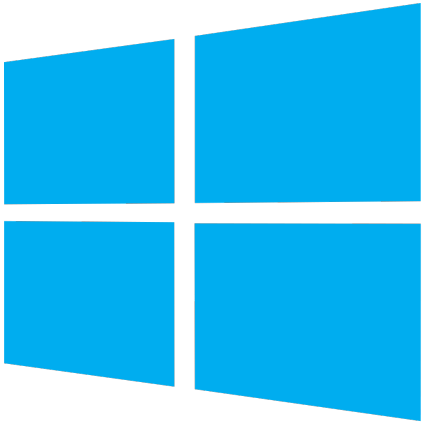
200+ companies hiring for geospatial data science roles

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...

ALI AHMADALIPOUR AUG 16, 2022 6

Getting started on this week's lab

- Go to course page:
  - https://cleo-lab.github.io/gds-applications-site/labs/week1/assignment1.html
  - Also see Canvas for links



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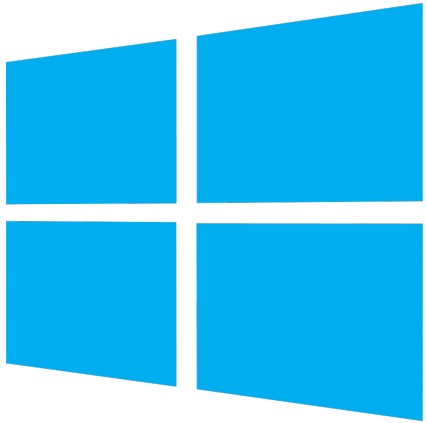

Complete background survey (on Canvas)