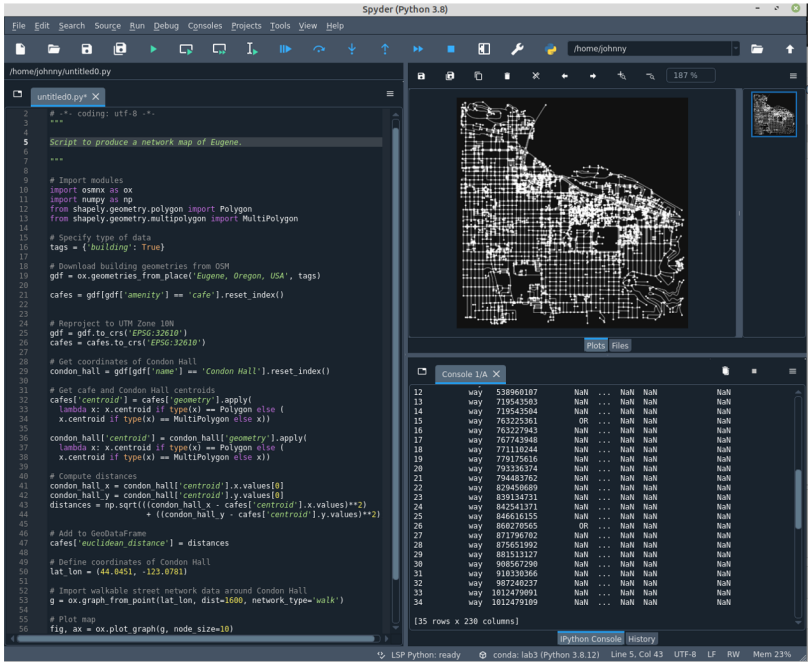
Geospatial Data Science Applications: GEOG 4/590

Lecture 1: Introduction



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Office hours: Monday 15:00-17:00 in 165 Condon Hall

Welcome

Dr. Johnny Ryan, Assistant Professor of Geography

- BSc in Geography at University of Nottingham, UK
- MPhil in Polar Studies at University of Cambridge, UK
- PhD in Geography at Aberystwyth University, UK

- Researching glaciology, hydrology, remote sensing

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COVID Policies

- All classes will be held **in-person** in accordance with the latest university policies
- Mask wearing is mandatory indoors for all students
- Please do not come to class or lab if you are feeling sick or have been exposed
- Let me and/or Insang know if this happens and we will work with you to make up the missed materials.

COVID Policies

Time to get to know your neighbors!

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

Overview

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

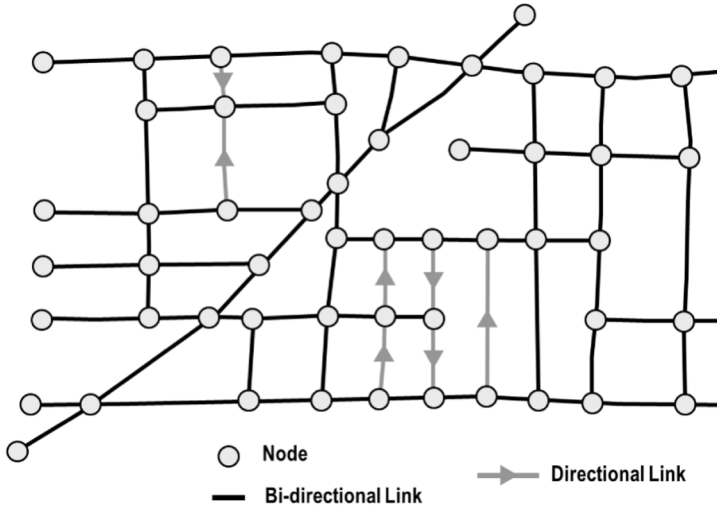
- Course schedule
  - Lectures, labs, grading

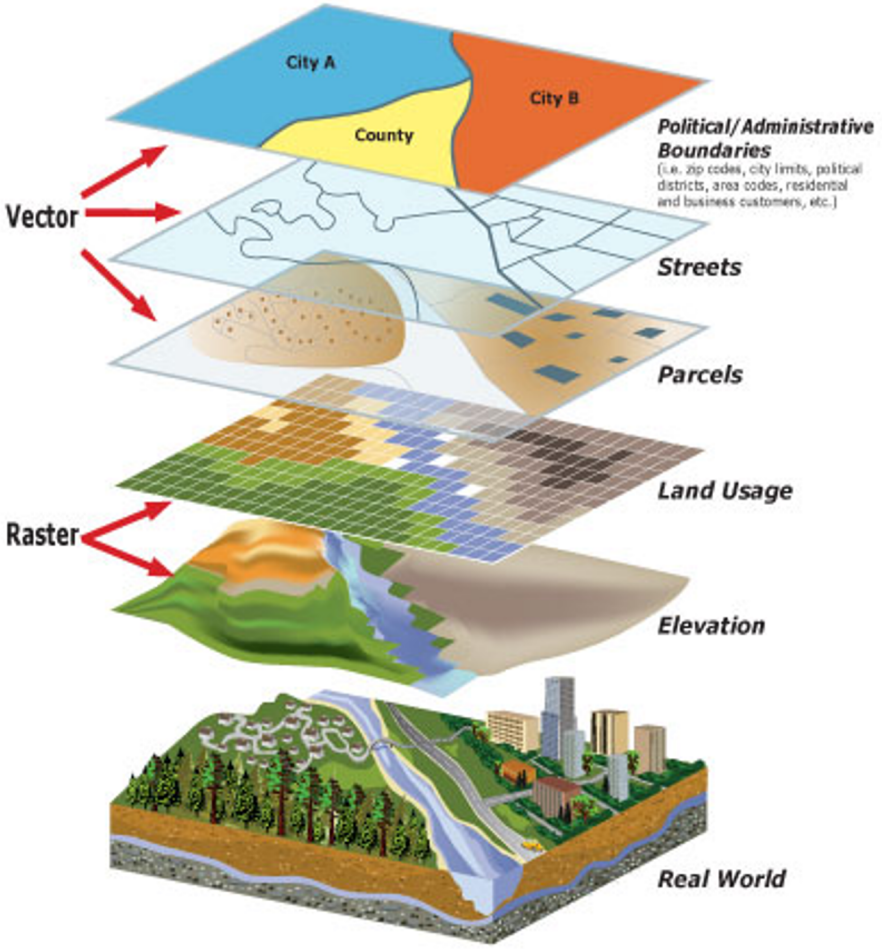
- Final project

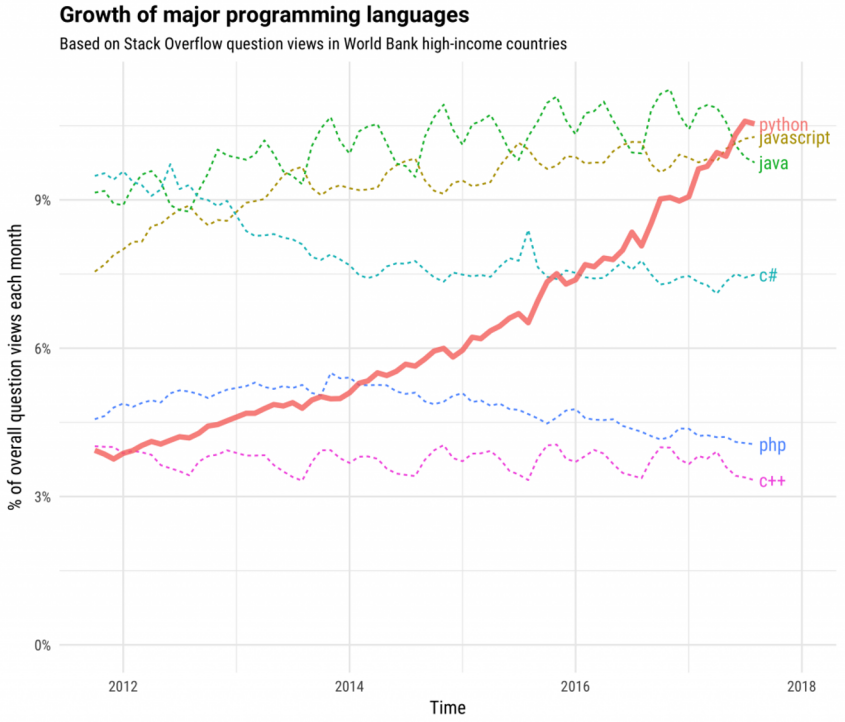
- Some tasks
  - Complete background survey on Canvas
  - Join Slack workspace
  - Getting started in Wed/Fri lab session

Geospatial data

- Vector data
- Network data
- Raster data







Python

- Popular high-level programming language
- Easy-to-read
- Extensive library
- 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

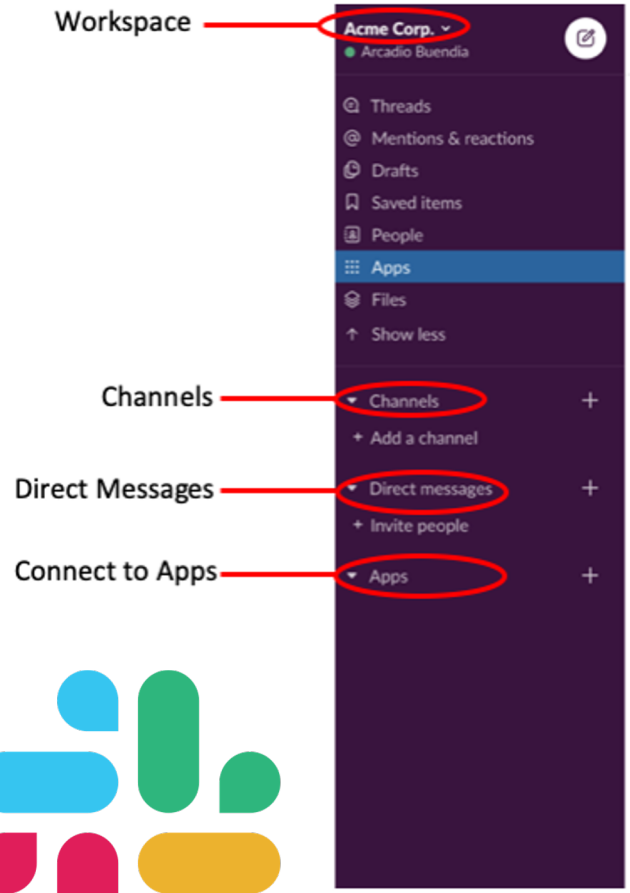
- GitHub
  - A cloud-based Git repository hosting service
  - Makes it easier to coordinate work among programmers collaboratively developing source code during software development

- 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

Slack

- Messaging app that facilitates collaboration by having all features in one place
- Starting to replace email, more secure, organized
- You should have received invitation to join course workspace
  - Use the standalone **desktop app** rather than the web interface
- We will use Slack for announcements, discussion, and questions
  - Asking questions on Slack is **not** cheating!



Course schedule

- **Lectures:** Monday 2pm in 106 Condon Hall
  - 8 lectures
  - Holiday on Jan 17, class presentations in Week 10

- **Labs:** Wednesday @ 2pm or Friday 10am in ~~442 MCK~~ **207 Condon Hall**
  - 7 labs
  - 2 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%)
  - Presentation due **March 6, 11:59 pm**
  - Write-ups due **March 11, 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	Lab
1	Jan 3	Introduction	Getting started with Python an GitHub
2	Jan 10	Table data	Wildfire and Census data
3	Jan 17	Network data	Walking distances
4	Jan 24	Gridded data	Remote sensing and climate reanalysis data
5	Jan 31	Machine learning	Three machine learning examples
6	Feb 7	Data/code management	Get started on project
7	Feb 14	Data access	Application 1
8	Feb 21	Visualization	Project work
9	Feb 28	Ethics and responsibility	Application 2
10	Mar 7	Project presentation	Project presentation

Working with geospatial data

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Working with geospatial data

Machine learning

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Working with geospatial data

Machine learning

Key skills

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Working with geospatial data

Machine learning

Key skills

What we *should* and *shouldn't* do

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 on Slack 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 on the #final-projects Slack channel
- **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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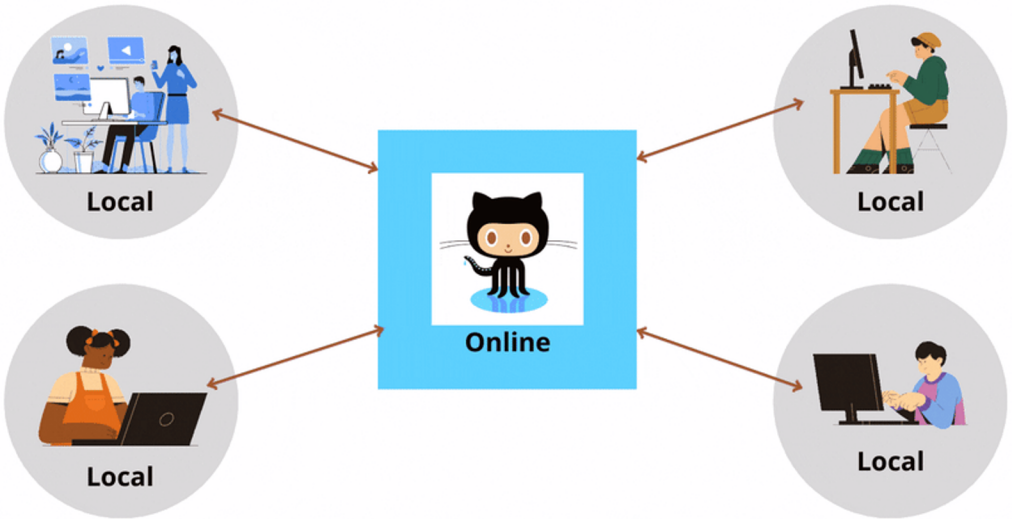
I will send reminders out about upcoming milestones

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

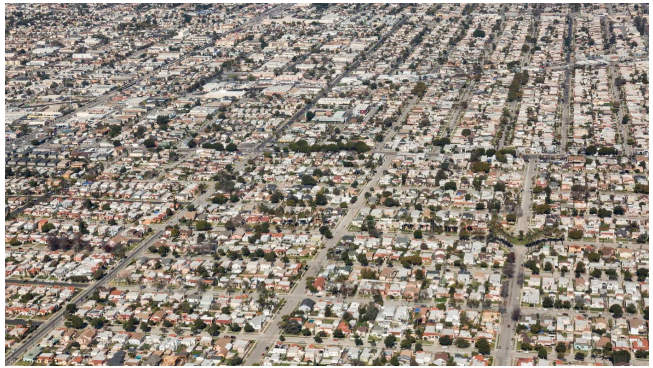
Some course themes

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



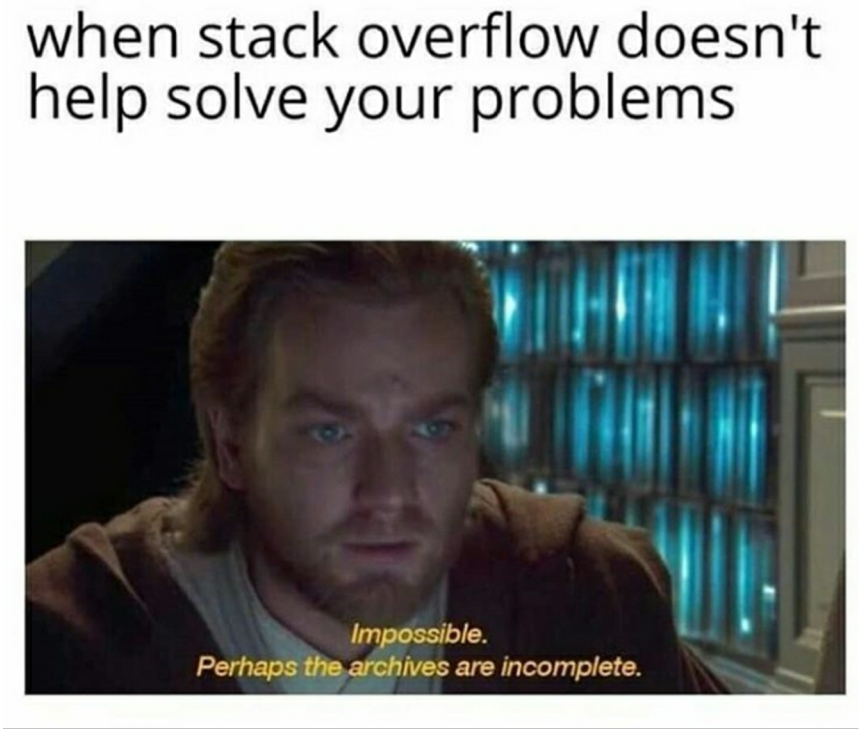
Some course themes

- 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
- Adapt code, don’t write code
- Make use of stackoverflow
- Ask peers
- Be scrappy



Some course themes

- Take responsibility for learning
- Organize your files
- Check Canvas and Slack 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…

- Learn how to solve real-world problems using spatial analysis
- Understand basic machine learning concepts for data science
- Collaborate on software development using version control
- Communicate results of data science project orally and as short write-up

Getting started on this week's lab

- Go to course page on GitHub:
  - https://github.com/JohnnyRyan1/geospatial-data-science
  - See Slack (or Canvas assignment) for links

- Operating systems… Linux, OSX are great, Windows is OK could consider using Windows Subsystem for Linux