W01D4

Miniproject Introductions

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Outline for today

- Python/APIs review
- Value of miniprojects
- Strategies for miniprojects
- GitHub demo
- Project presentations

Python/APIs review

Value of miniprojects

Projects in data science

- Primary source of knowledge/experience
- Most important part of job interviews
- Benchmarking a new technique
  - Example: you develop a new classification algorithm and want to compare it to existing ones
  - Use popular publicly available benchmark datasets (e.g. from Kaggle)
- New use-case for existing technique
  - Example: you apply a product-recommendations algorithm to your business's order history

Projects at Lighthouse Labs

- Question/answer-based or open-ended
  - Come up with some of your own problem statements and goals to frame your work
  - Not limited to *just* answering the questions
- Miniprojects
  - APIs - Python data structures (individual)
  - Databases (SQL) - Pandas (individual)
  - Feature engineering - Dimensionality reduction - Unsupervised learning (pairs)
  - Supervised learning - Deployment (individual)
  - Deep Learning - NLP (individual)
- Midterm project: predict flight delays OR analyze NYC neighbourhoods (pairs)
- Open-ended final project

Individual and group work

- Two minds do not necessarily code twice as fast!
- Typical scenario: team of data scientists each with their own project
- Parallelization
  - Different sub-tasks
  - Different files
  - No pair-coding (unless to help someone)!
- Code reviews of each-other’s work
- GitHub: push only at working milestones (no errors)

This week’s miniproject

- Part 1: Transport of London API
  - Example: Plan the journey from Heathrow Airport to Tower Bridge using Public Transport, Taxi or Bike? Which way is the fastest?
- Part 2: The Movie Database API (stretch)
  - Example: Find top 5 trending movies
- Challenges:
  - Working with difficult documentation (poor descriptions of what input/return values are)
  - Parsing complex data structures (nested lists/dictionaries)
- 5 minute presentation (plus 1 minute feedback)

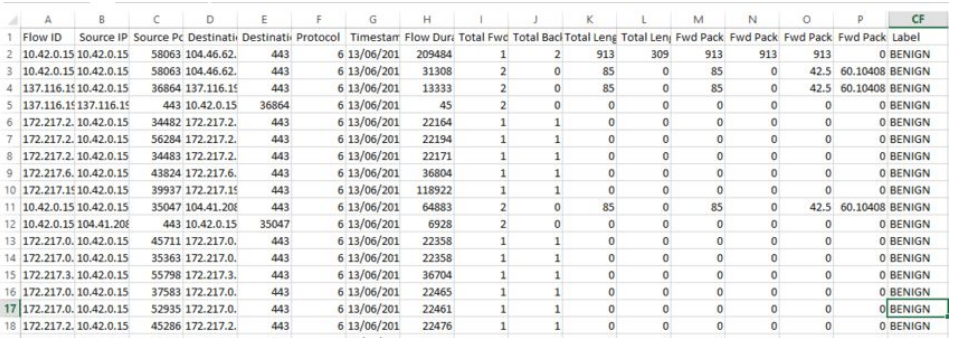
Strategies for miniprojects

Code

- Define functions and/or classes whenever possible
  - e.g. get_transit(origin, destination)
  - Any time you find yourself writing similar code again and again, make a function
- Save trained models and only retrain when needed
- Save GET request results and only fetch when needed (e.g. function that checks if data has been fetched, fetches data at a URL, then saves it)
- Jupyter code blocks should have a clearly defined goal.
- Periodically refactor code (i.e. clean up, reorganize, consolidate)

Explore the dataset, API, and other tools

- Play with the dataset
  - What do the variables mean?
  - Which variables are categorical, ordinal, and continuous?
  - Range/variance of each variable?
  - Plot the dataset!!!
- Try out the API functions and explore the returned structure
  - For json, print using JSON(response)!



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3	10.42.0.15	10.42.0.15	58063	104.46.62.	443	6	13/06/201	31308	2	0	85	0	85	0	42.5	60.10408	BENIGN
4	137.116.15	10.42.0.15	36864	137.116.15	443	6	13/06/201	13333	2	0	85	0	85	0	42.5	60.10408	BENIGN
5	137.116.15	137.116.15	443	10.42.0.15	36864	6	13/06/201	45	2	0	0	0	0	0	0	0	BENIGN
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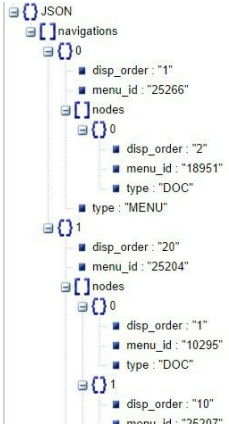
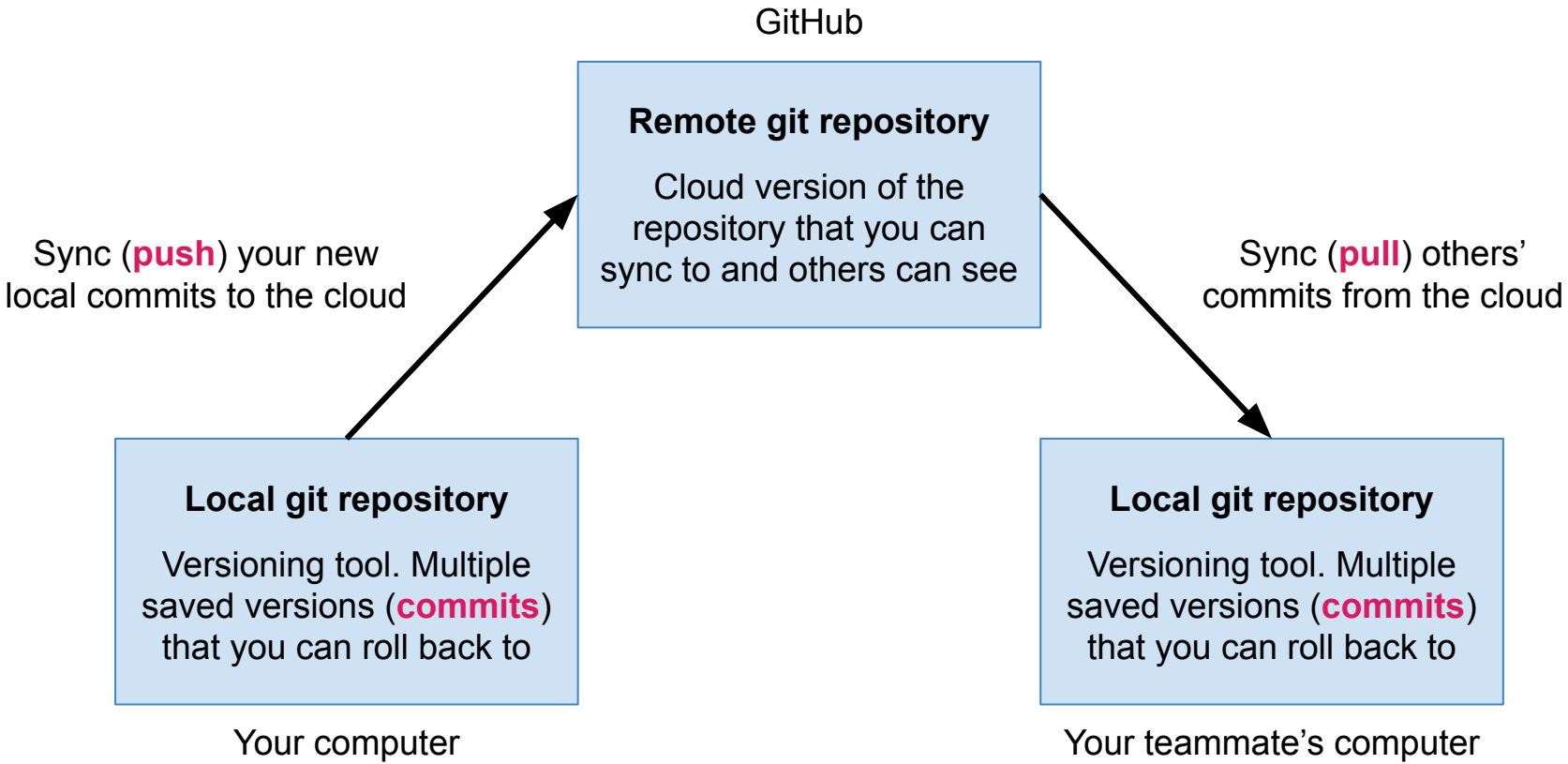
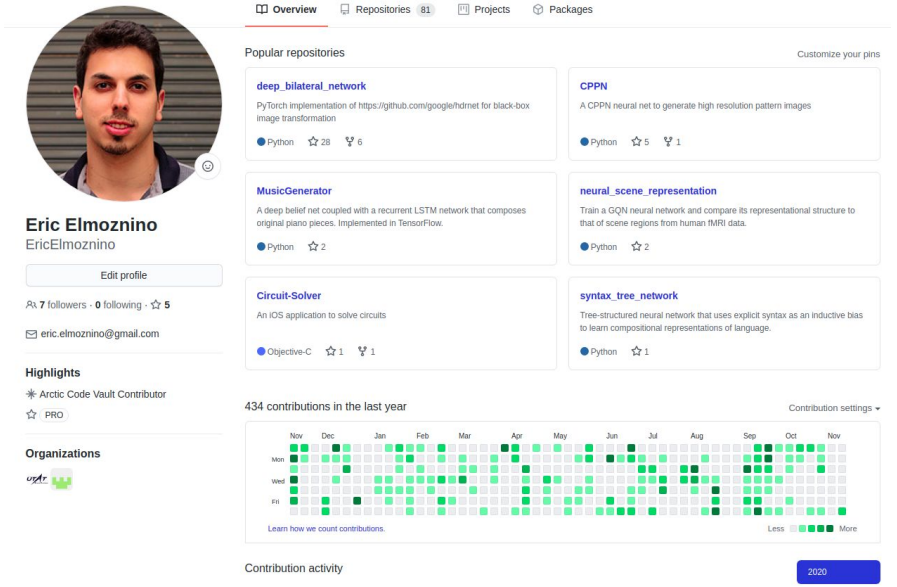


Git and GitHub



Why use git?

- **Public**: Employers can see all the projects you've worked on
- **Versioned**: You will have a history and can roll back to old commits
- **Server deployment**: Just git pull to any new machine
- **Teamwork**: Everyone can work on their own copy and working versions to the master copy



GitHub essentials

1. 1 person creates a repository on GitHub (with README.md)
2. Clone the repository

```
cd [directory you want to work in]
git clone [repository url]
cd [repository name]
```

3. Make changes (e.g. create jupyter notebooks, add code, etc.)

```
git add [file path]                          # add any new files to version control
git commit -am "[your commit message]"       # register changes as a new local version
```

4. Sync with the remote (cloud) copy. Pull others' changes, push your own

```
git pull        # remote changes -> your copy
git push        # your copy -> remote (error if there are changes you haven't pulled)
```

GitHub demo

Project presentations

General pointers

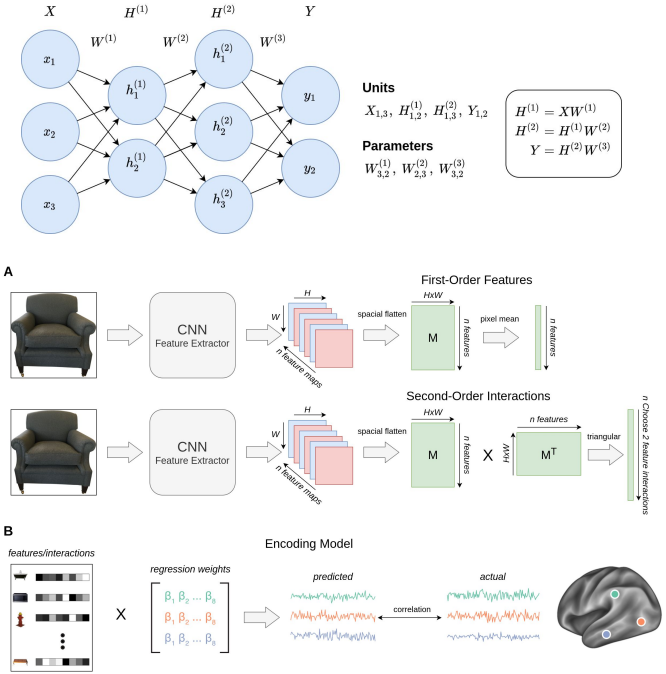
- Present as if to a client (who has some data science knowledge)
- Make it a story
  - What is the problem?
  - What is the dataset?
  - How did you analyze the dataset?
  - What were the findings?
- You can walk through code, but only as a chronological reference for explaining how you analyzed the data
  - However, I recommend having *no code at all*

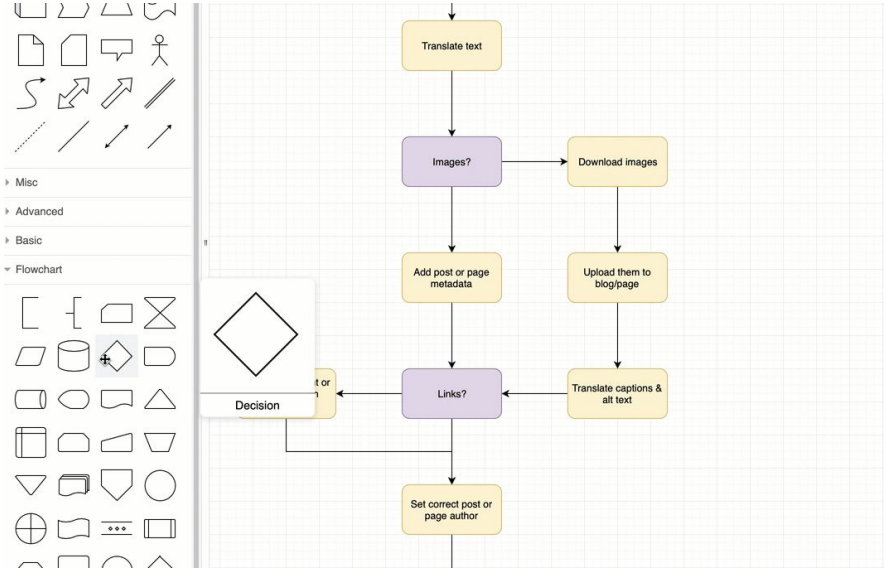
Presentation structure

- **Motivation**: What is the problem? Why is it important (either business, public good, or research perspective)?
- **Task**: Problem from a technical perspective. Description of the dataset, features and targets, data exploration
- **Modeling**: *Important* aspects of your approach. How did you process the data or engineer features? What model did you use? Use schematics!
- **Results**: Visuals! Show metrics and experiments. Demo (if any)
- **Conclusions**: What worked? What didn't (and why)? How are we better off? Where could the project go next?

Figures: draw.io

- Good for schematics, model diagrams, shapes, math typesetting, etc.





Figures: python plotting libraries

- Good for displaying information about your dataset and results