Python Computing for Data Science

Files for Today:

https://goo.gl/dyKHxx = this PDF

https://goo.gl/N4r9xX = Jupyter Notebook

Files for the Course:

git clone https://github.com/profjsb/python-seminar.git

(if you dont have *git,* please set it up later)

Signup (Piazza):

https://piazza.com/berkeley/spring2018/ay250class13410

Welcome to the
Python Computing for Data Science
Seminar

AY 250: Monday 2-5pm (Campbell Hall 131)

Instructor: Josh Bloom

GSI: Chelsea Harris

Instructor+GSI email:
ucbpythonclass+seminar@gmail.com

Computational Science and Engineering

GORDON AND BETTY MOORE FOUNDATION

NSF

Award #0941742

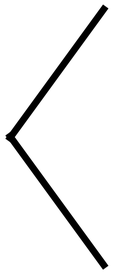
Democratizing Trends in the Sciences

Data	Decreasing cost to obtain, move, store	→	open data, more freely shared
Compute	Decreasing cost, increasing specialty	→	more accessible
Technology/ Methodology	Algorithmic innovation, software tooling	→	open source

If anyone can get Data, Compute, Tech… who wins?

domain expertise → **She who asks the right questions**

\+

data science 

She who answers questions better & faster than others:

- computational access
- methodological inference (e.g., machine learning)
- better story telling, dissemination of results
- reproducibility (acceptance)

Motivation:

short version

FTW: leverage the Python ecosystem to do cutting-edge research

long version

1) get you using Python to do cutting-edge research in the physical, biological and/or social sciences
2) help you realize that Python is a viable framework to do just about any 21st century problem well (and costs zero). “Super Glue”

3) fold you into the Python community so you know how to navigate it yourself and so it potentially benefits from having you part of it

How we plan to do this:

- "formal" lectures on specialized topics each week by leading experts & local practitioners (Monday)

- "breakout work sessions" interspersed within the lectures

- homework assignments based on week's lecture

- final project

Prerequisites:

- working knowledge (or more) of the core Python language and/or Python BootCamp graduate

- installation of Python (3.6.X), scientific 3rd party packages (Anaconda distro), & git

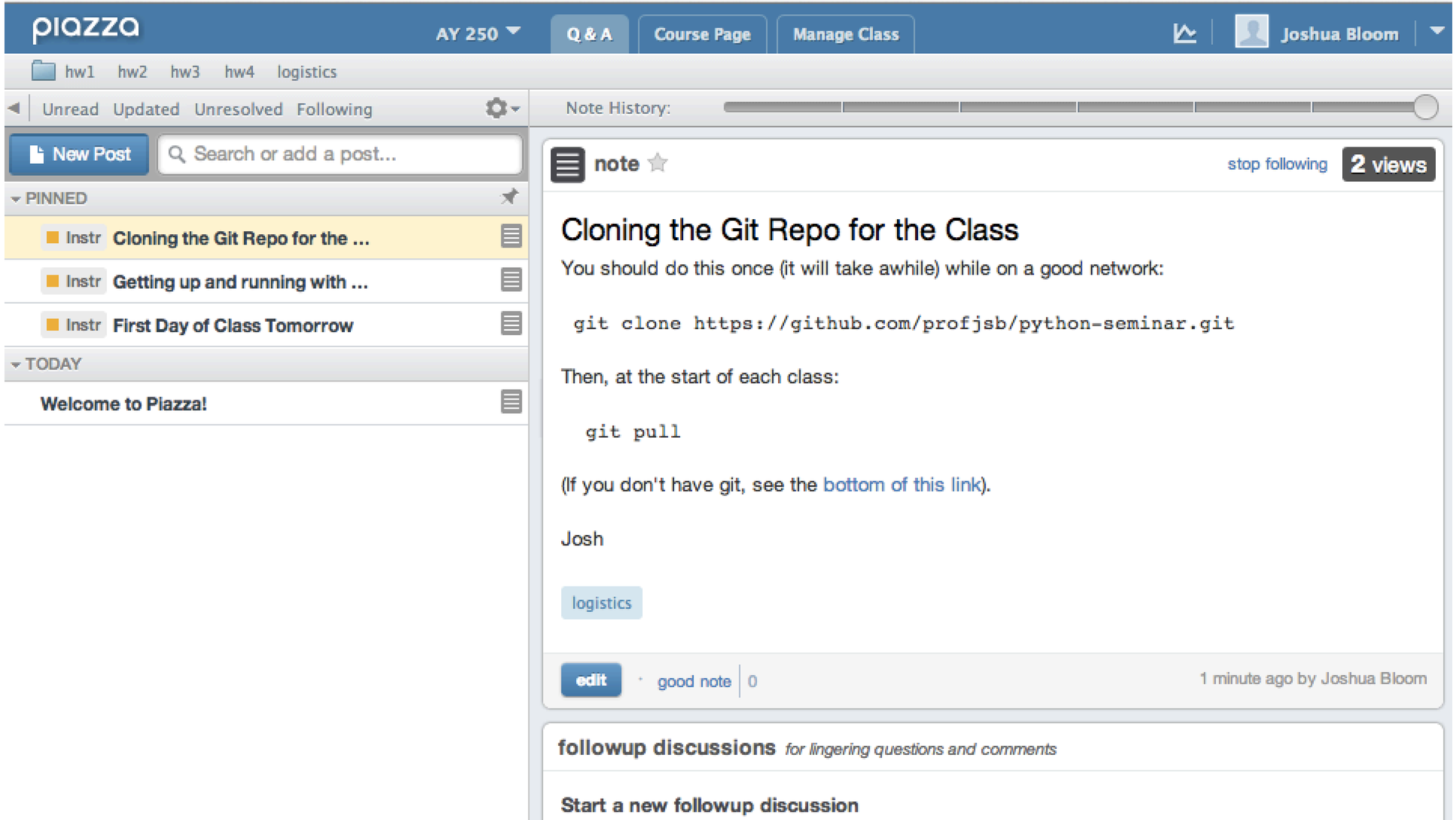
- laptop for use in class and for homeworks

- tolerance for our terrible computer humor

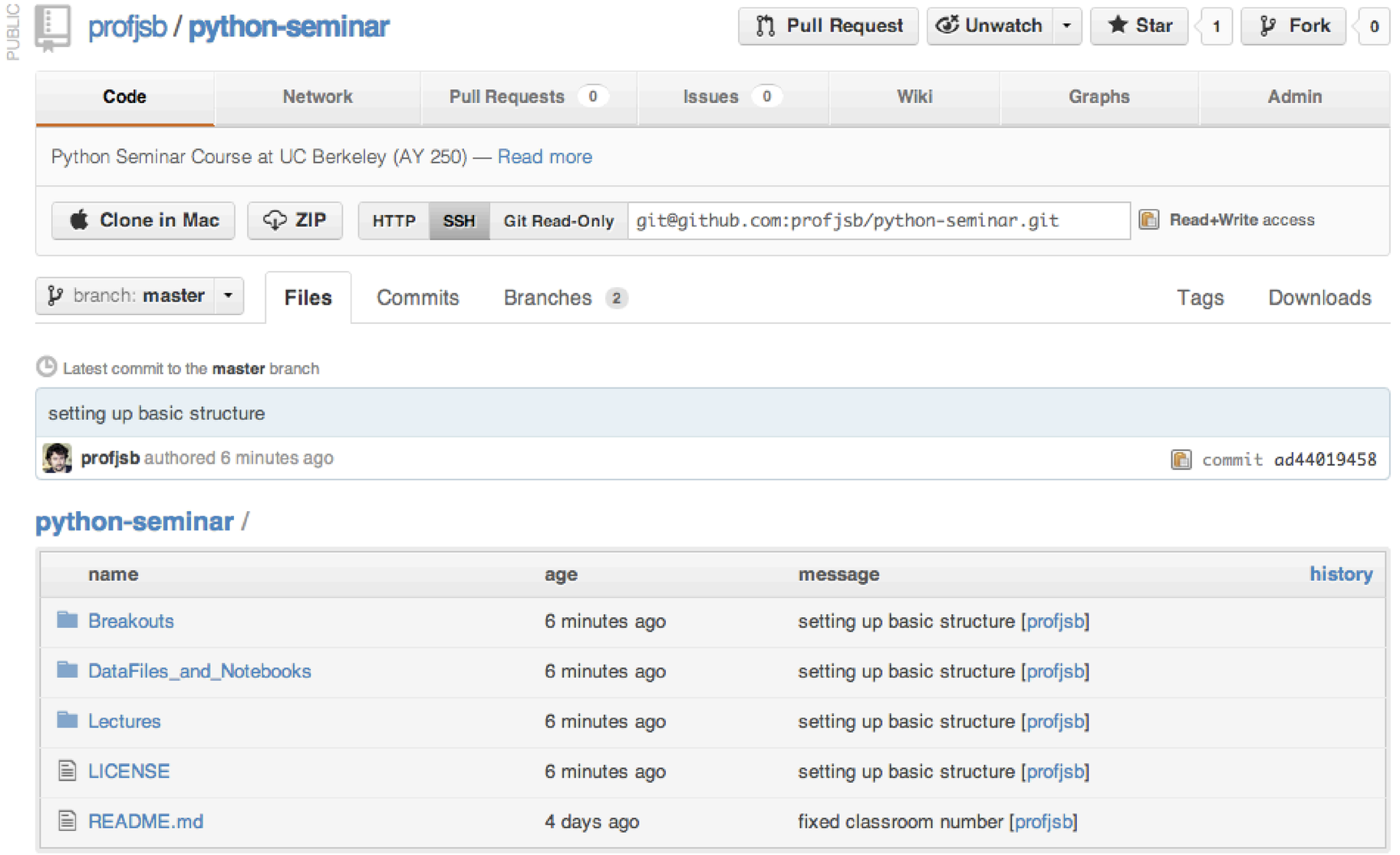
http://www.pythonbootcamp.info/preparation/software

piazza for real-time/off-line interaction
homework updates, solutions, ...

https://piazza.com/berkeley/spring2018/ay250class13410/home



github is the main data portal for us...



Scientific Research Computing with Python

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https://goo.gl/N4r9xX = Jupyter Notebook

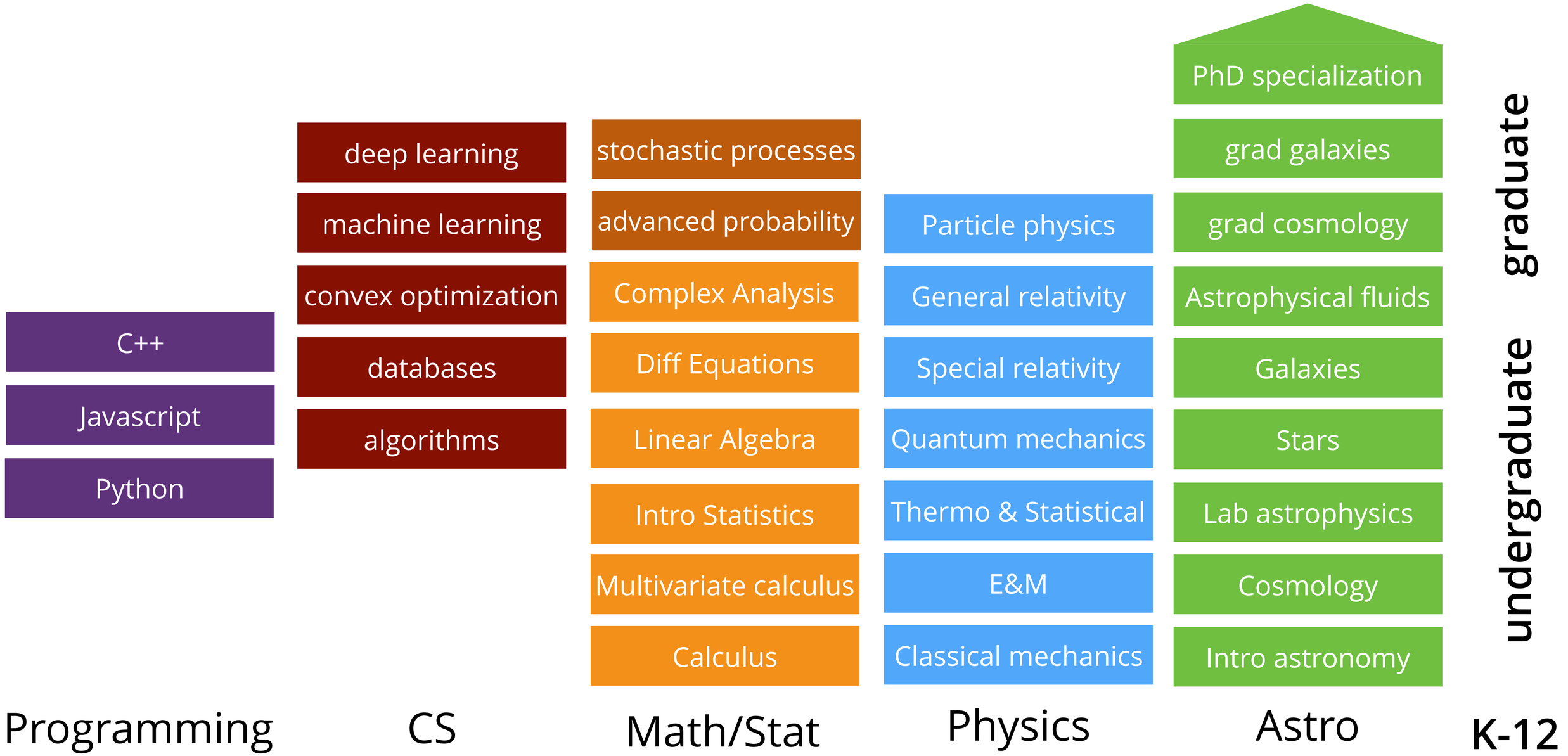
/DataFiles_and_Notebooks/00_AdvancedPythonConcepts = follow-along files

Jan 22	**Advanced Python Language Concepts** (decorators, OrderedDict, Generators, Iterables, Context Managers)	- GIT - scipy §2.1	Josh
Jan 29	**Pandas, Scipy, & Numpy**	- scipy §§ 1.3, 1.5, 2.2 - numpy - skim chap 4/5 of McKinney	Josh
Feb 5	**Data vizualization** (Matplotlib, Bokeh, Altair, Plotly, mayavi)	- Skim Tufte's Vizualization book - colormap talk (Scipy 2015)	Josh
Feb 12	**Interacting with the world** (requests, email, IoT/pyserial)	None	Josh
Feb 19	**Holiday** (no class)		
Feb 26	**Parallelism** (asyncio, dask, IPython cluster)	- [ipyparallel docs] (http://ipyparallel.readthedocs.io/en/latest/intro.html)	Josh
Mar 5	**Database interaction** (sqlite, postgres, SQLAlchemy, peewee), **Large datasets** (xarray, HDF5)	None	Josh
Mar 12	**Machine Learning I** (sklearn, NLP)	None	Josh
Mar 19	**Machine Learning II** (keras [tensorflow])	None	Josh
Mar 26	**Spring Break**		
Apr 2	**Image processing** (OpenCV, skimage)	None	**Stefan van der Walt**
Apr 9	**Web frameworks & RESTful APIs, Flask**	None	Josh
Apr 16	**Bayesian programming & Symbolic math**	Probabalistic Programming eBook install: pip install pymc3	**TBD**
Apr 23	**Speeding it up** (Numba, Cython, wrapping legacy code)	TBD	Josh
Apr 30/Onward	final project work		

Course Schedule

https://github.com/profjsb/python-seminar

Challenge of Data-Driven Domain Education Stack



Concepts/Practices in this Course

- Jupyter & JuypterLab
- using git & github
- Docker
- Data science workflows
- reproducible research
- application building
- debugging
- testing

"Data science is an interdisciplinary field about processes and systems to extract knowledge or insights from data in various forms, either structured or unstructured, which is a continuation of some of the data analysis fields such as statistics, data mining, and predictive analytics..."

-wikipedia

Workflow for a *typical* week

Friday:
email from next week's instructor w/ special installation instructions, reading/tutorials

Monday:
2:00 cd python-seminar; git pull
2:10 - 3pm Intro topics Lecture
3 - 3:30pm Breakout coding
3:30-4:50pm Detailed topics lecture (+stretch)
4:50-5:00pm Work on homework

Thursday?:
TBD Supervised help with homework [place TBD]

Monday Morning:
Homework project due

Course Grade

- 10% participation in lectures/breakouts

- 60% Problem Sets
  There will be 10 assignments. Do at least 6.
  We will keep your best 5.

- 30% Final Project, due May 10 (no final exam)

Final Project

a) Build a substantial framework for doing something in your own research, based on at least two topics from different weeks. Something you will use for a long time...

e.g., image analysis package, hardware control software, a webservice that does some crunching under the hood, provide a parallelization of some algorithm or code you use, etc.

- or -

b) Contribute code/functionality to an open-source Python project (Juypter, scipy, Cython, numpy, matplotlib, etc.)