JupyterHub in Engineering Education

PyData PDX November, 2019

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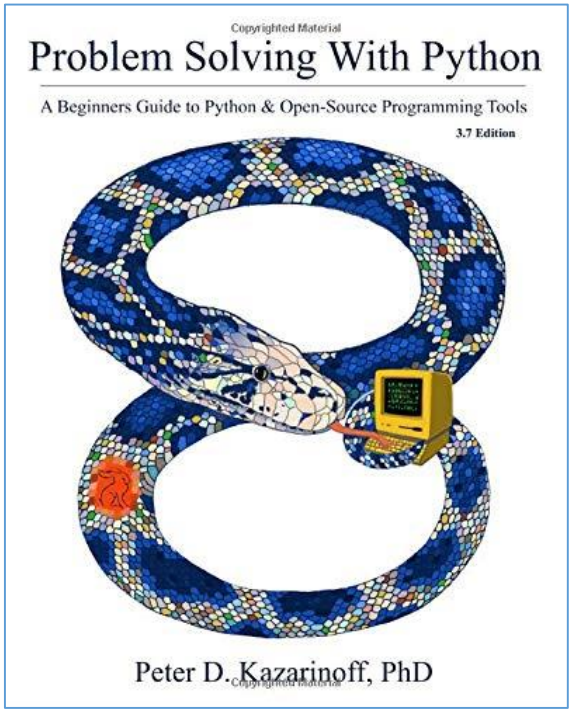
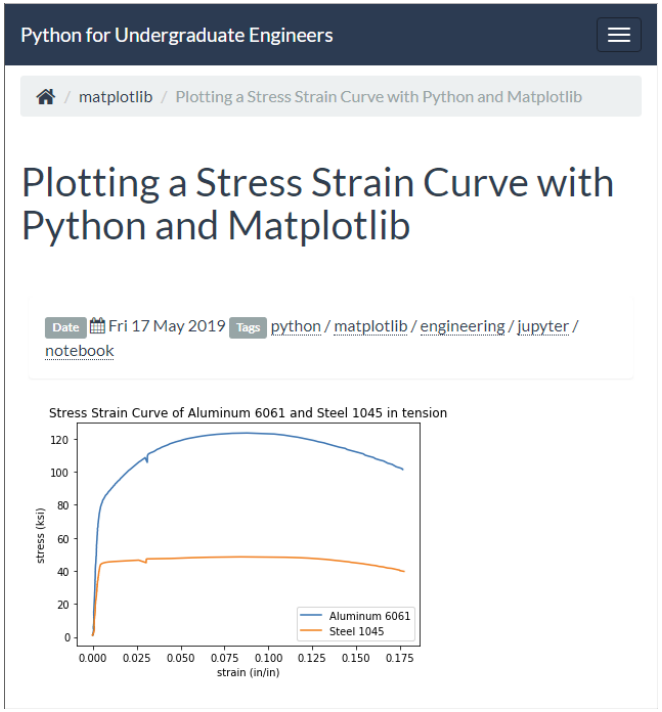
Portland Community College
@pkazarinoff GitHub: ProfessorKazarinoff

Slides: github.com/ProfessorKazarinoff/PyDataPDX-2019-11

Who is Peter?

- Engineering Transfer
- 2-year Engineering Tech





Blog: pythonforundergradengineers.com

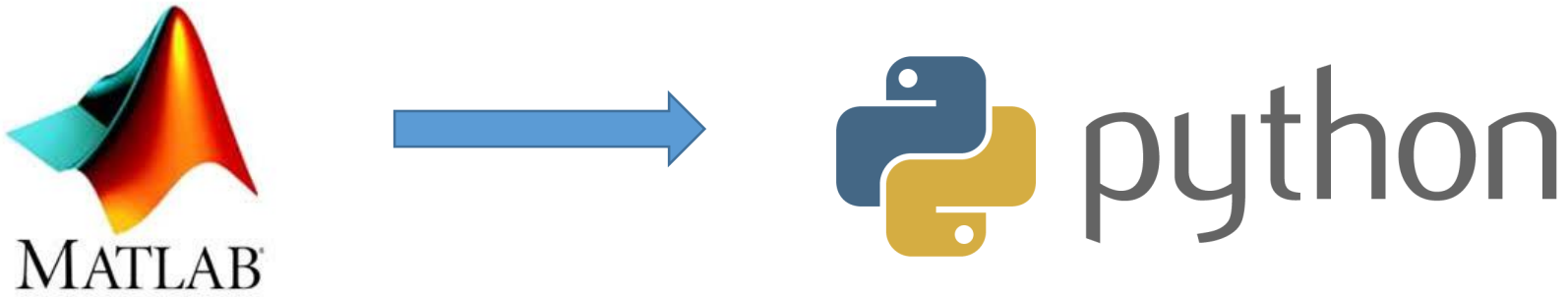
GitHub: github.com/ProfessorKazarinoff

Twitter: @pkazarinoff

- 6 in 10 of CC students experience food insecurity
- 3 in 10 CC students experience housing insecurity
- 1 in 10 of CC students is homeless

(according to PCC in-service 2019)

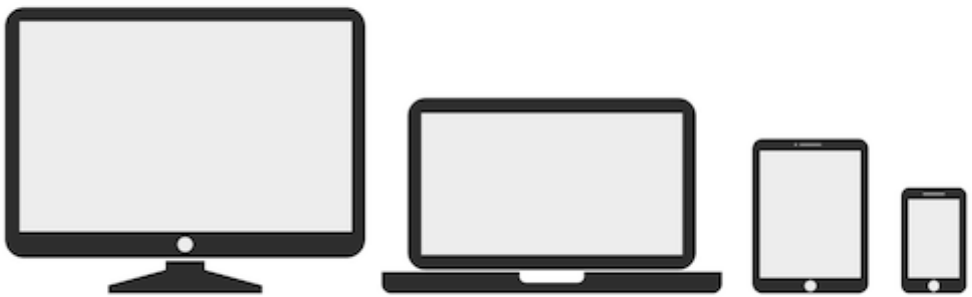
Moving from MATLAB to Python



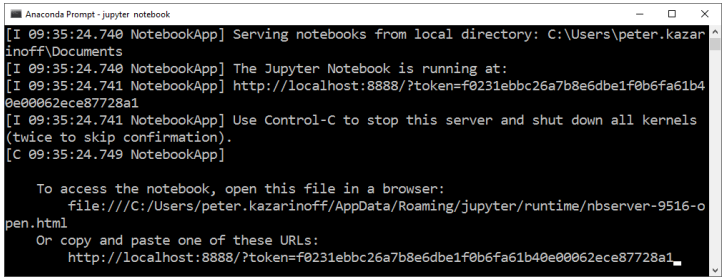
Could save students $25,000 in one year

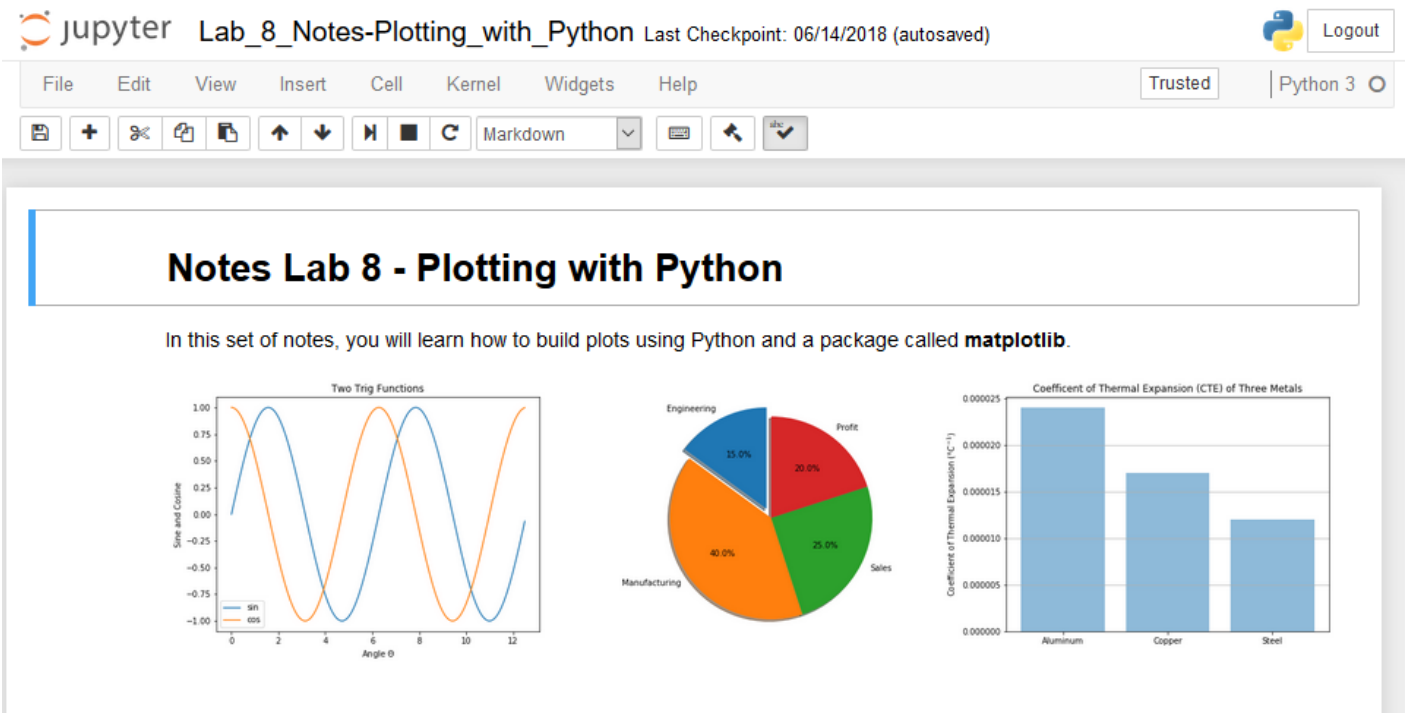
(7 classes of 24 students $49 license + $105 book)

Students use Desktops, Laptops, Chromebooks, Tablets and Phones



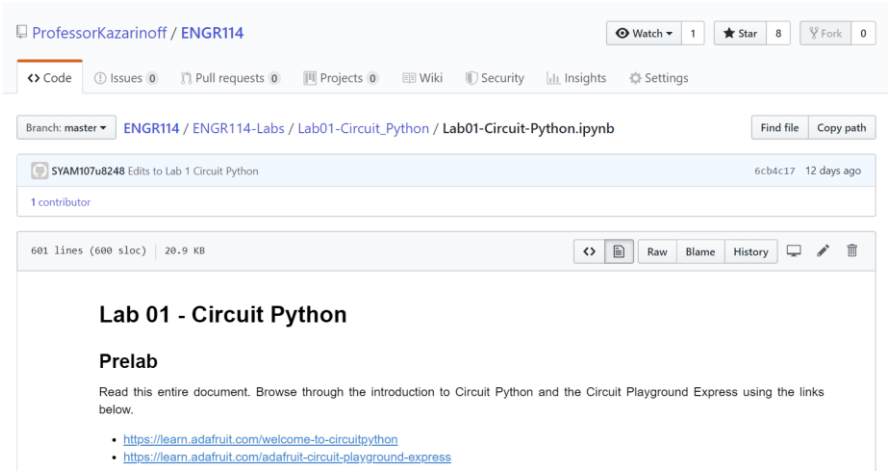
Jupyter Notebooks



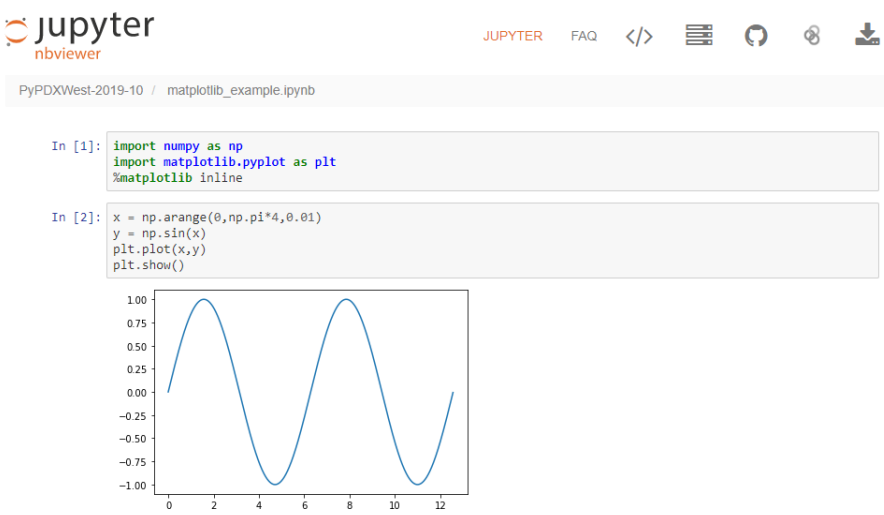


Static Jupyter Notebooks Online

GitHub



nbviewer

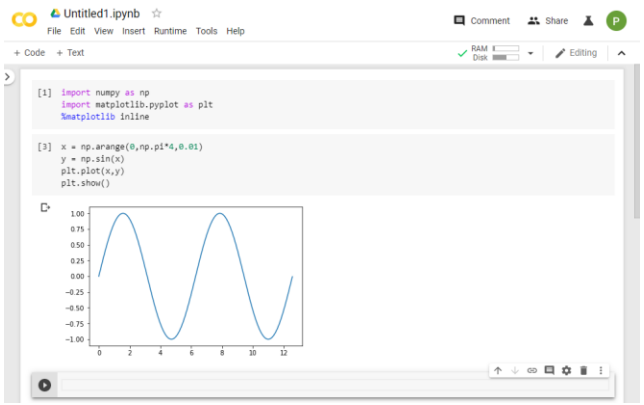


Dynamic Jupyter Notebooks Online

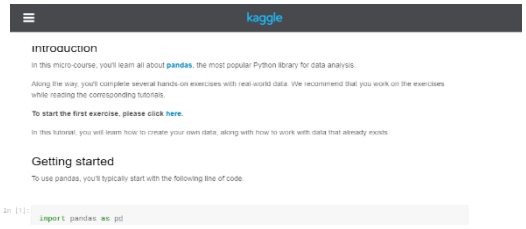
binder

Turn a Git repo into a collection of interactive notebooks

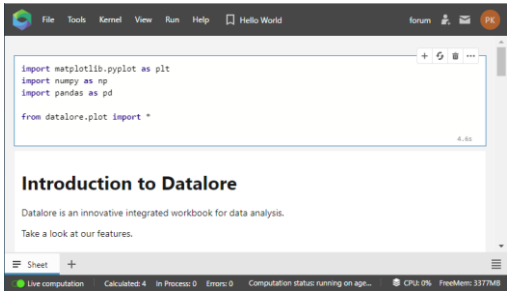
Google CoLab



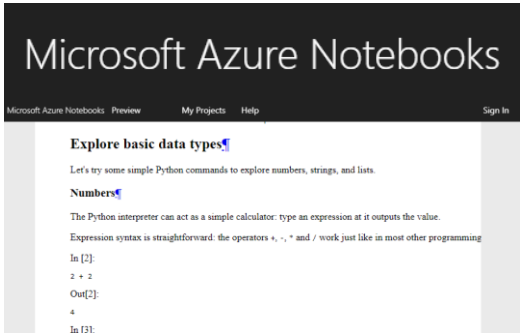
Kaggle Kernels



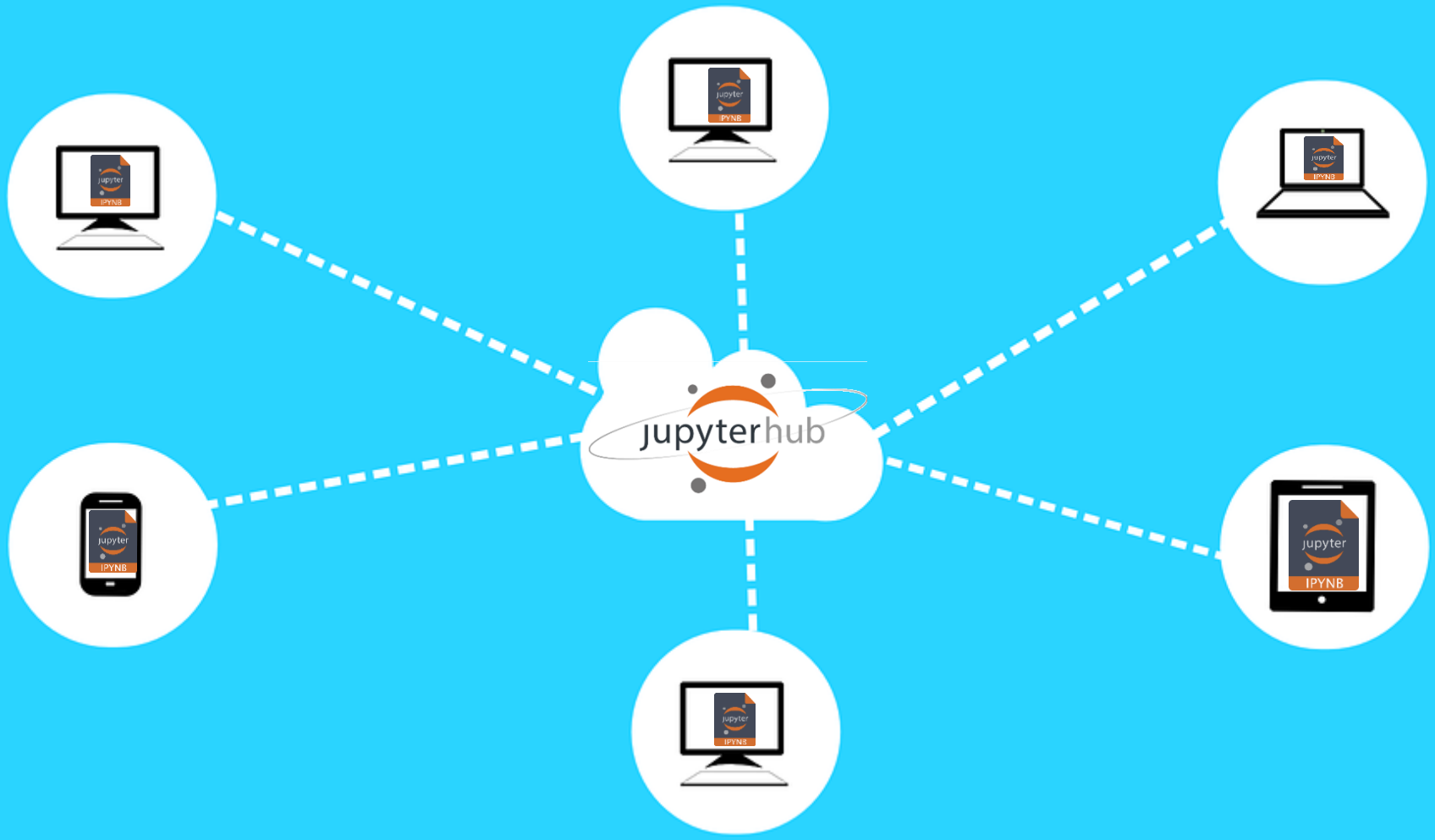
JetBrains Datalore



Microsoft Azure Notebooks



JupyterHub



JupyterHub


jupyterhub


Massachusetts
Institute of
Technology


MICHIGAN STATE
UNIVERSITY


Cal
GOLDEN BEARS

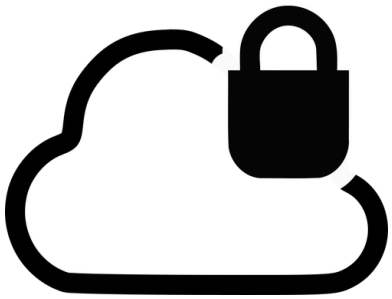

University of Colorado
Boulder


CLEMSON
UNIVERSITY


Portland
Community
College

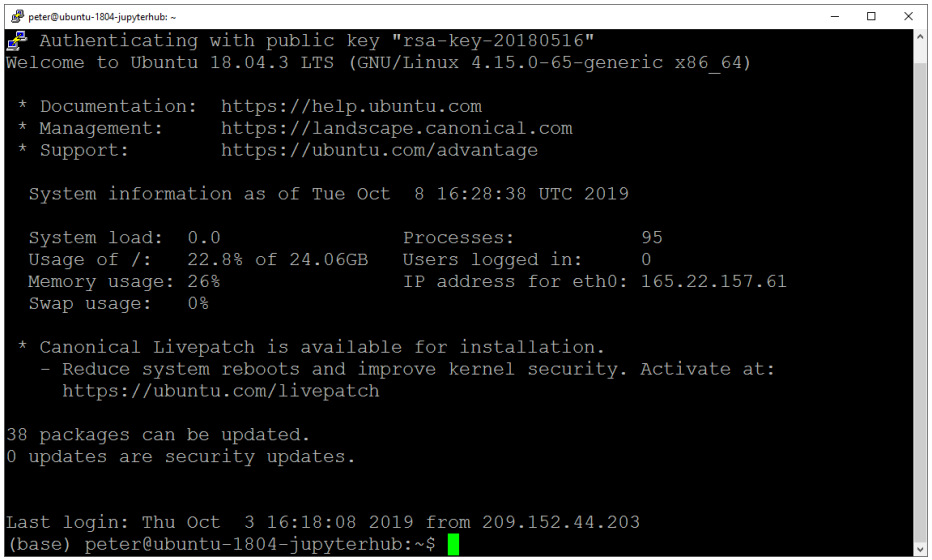
Why use JupyterHub?

- You have your own OAuth and don't want to use additional usernames and passwords
- Your data is private and can't be shared in the public cloud
- Need custom packages, custom environment not available publically
- Share documents/data across users



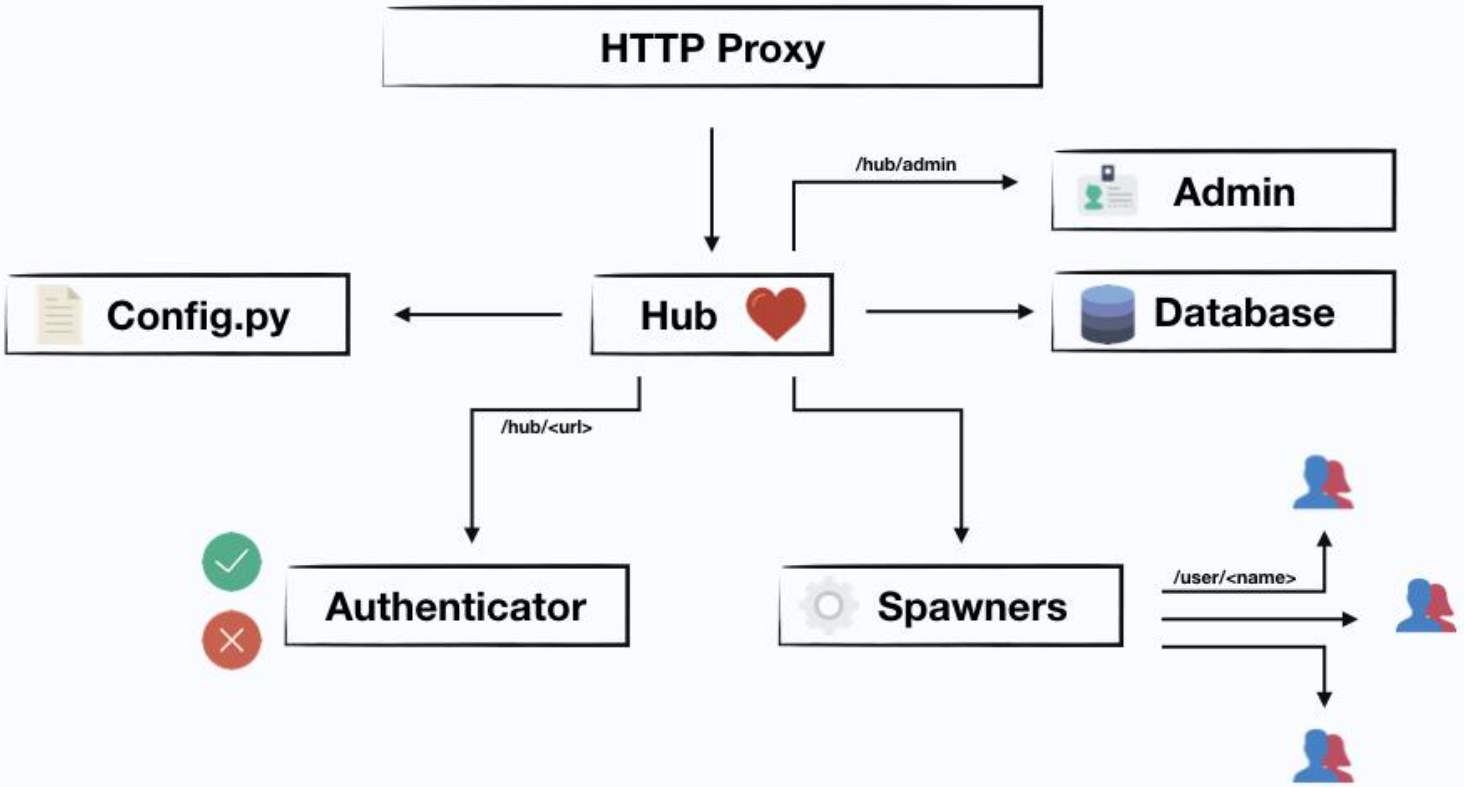
Setting up JupyterHub

- VPS (Digital Ocean, Linode, AWS, Google Cloud, Azure, or Local Server)
- Root access (can run without sudo, but it's more complicated)
- Install Python and JupyterHub
- Configuration file
- Domain name and SSL cert
- Can use Nginx reverse proxy
- Authentication: PAM, GitHub, Google or other OAuth



https://jupyterhub.readthedocs.io/en/stable/

JupyterHub

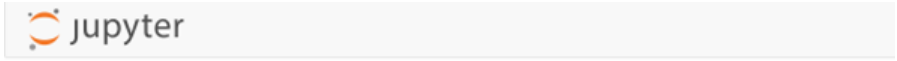


All icons where obtain on Flaticon (https://www.flaticon.com/packs/essential-collection)

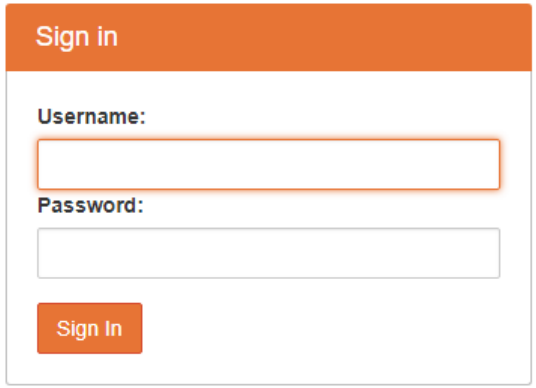
Image: JupyterHub Docs

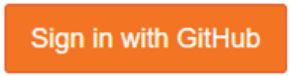
Authentication

GitHub OAuth

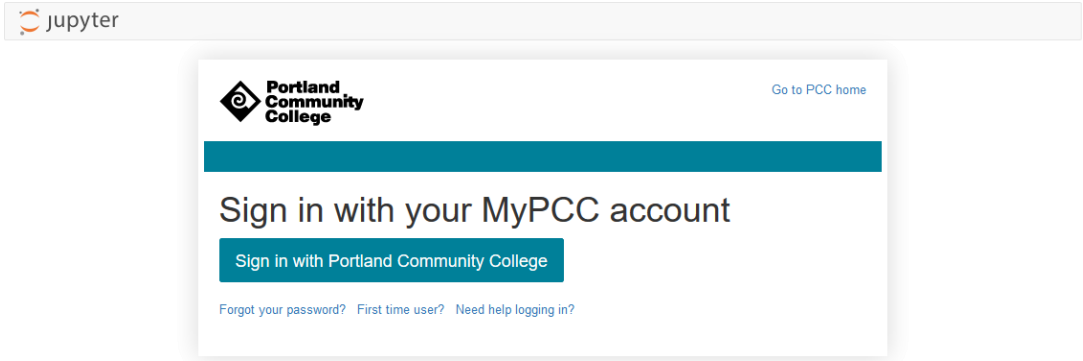


PAM Authenticator (built into Linux)





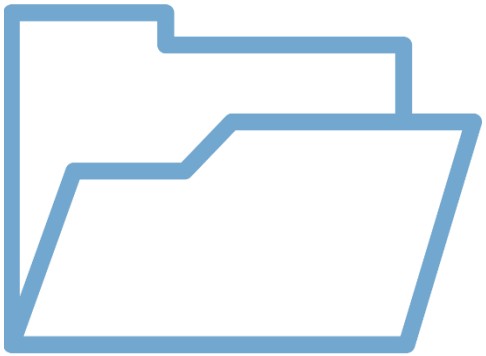
Google OAuth



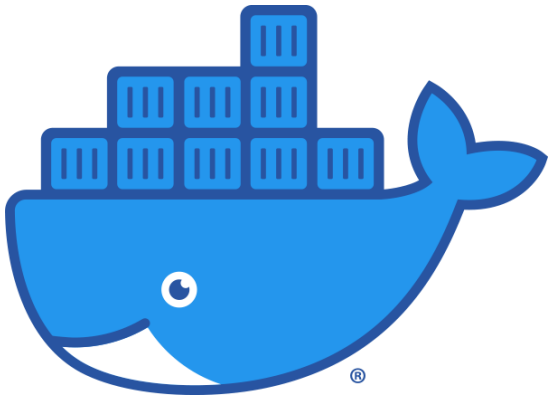
- Other OAuth Services:
  BitBucket, GitLab, Globus, MediaWiki, Okpy, OpenShift, CILogon, AuthO

Storage

VPS File System



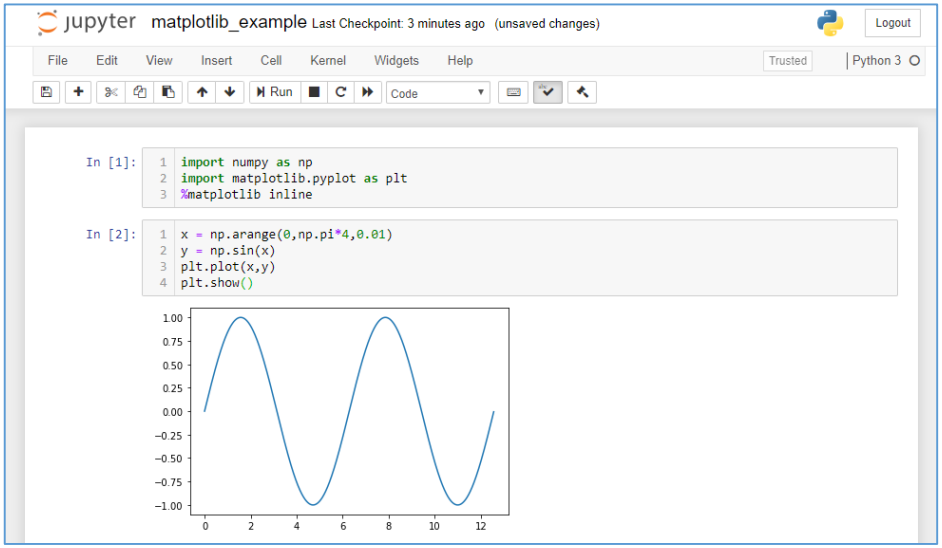
Docker



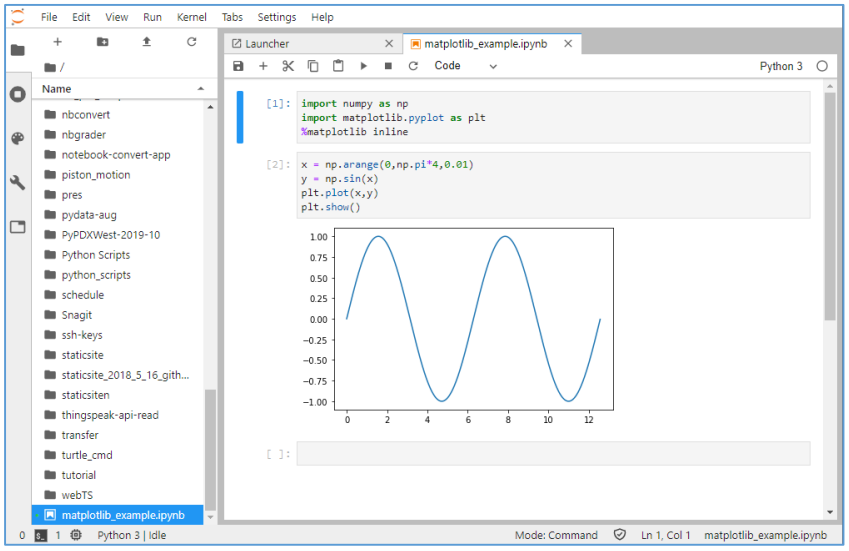
Kubernetes

Classic Notebook or JupyterLab Interface

Classic Notebook Interface

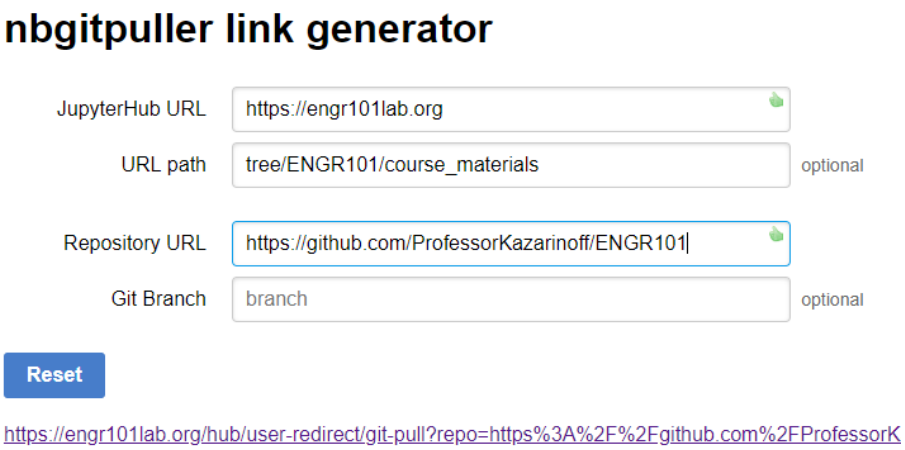


JupterLab Interface

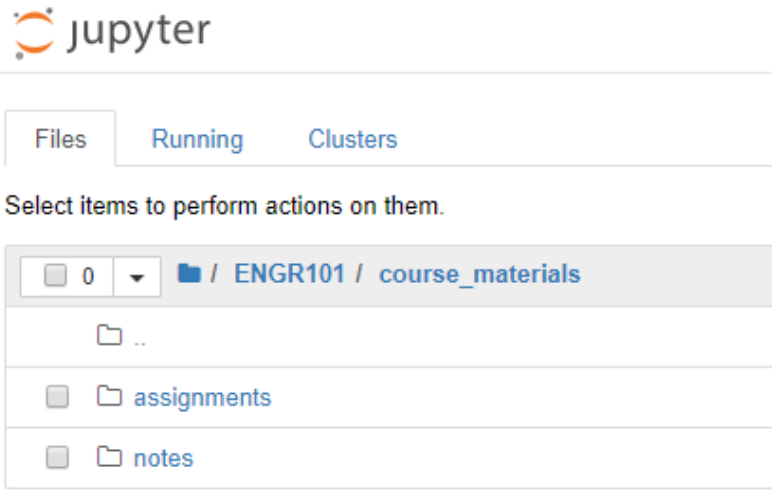


nbgitpuller Extension

Build a URL for your users

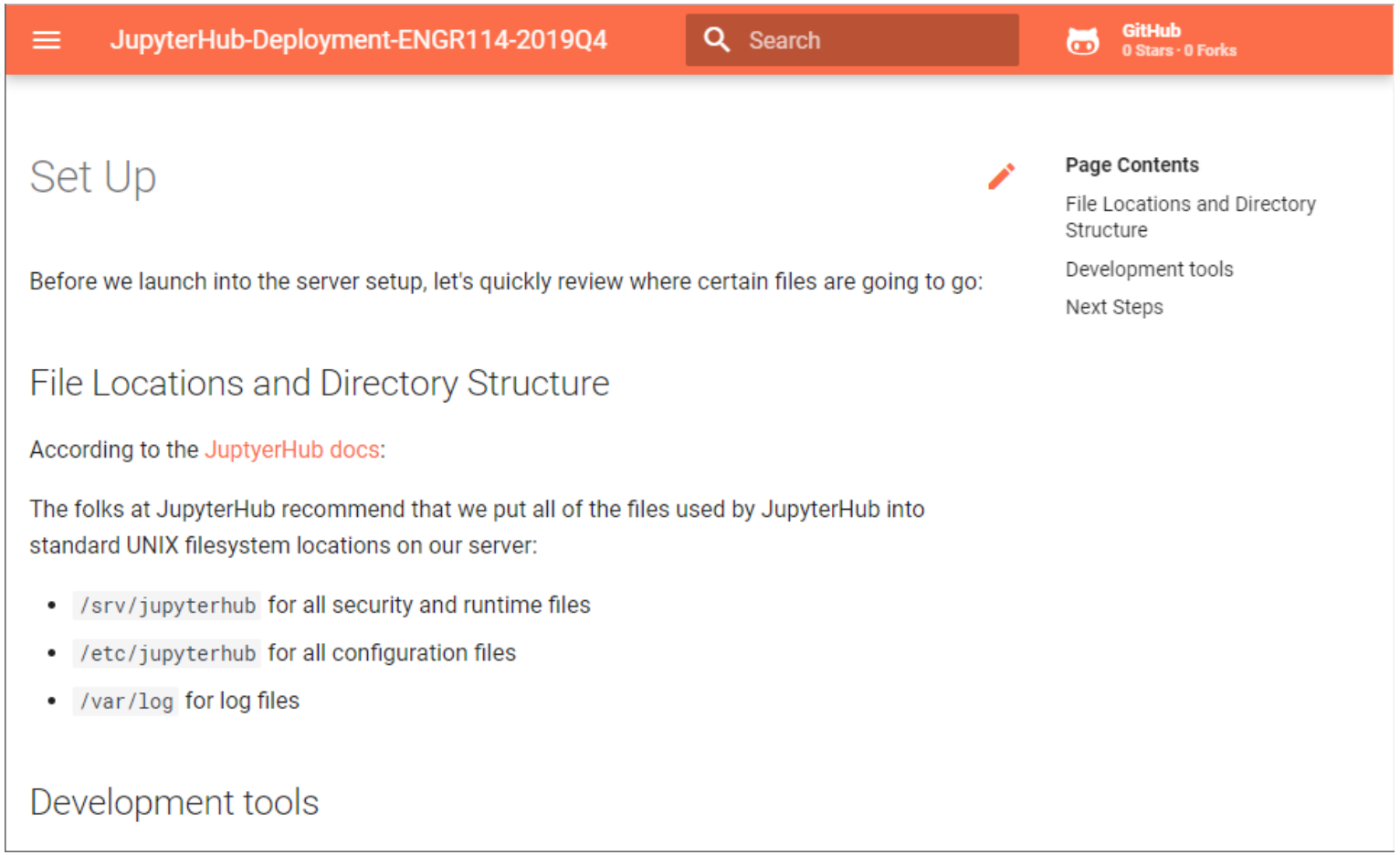


GitHub Repo Pre-populates in user's file system

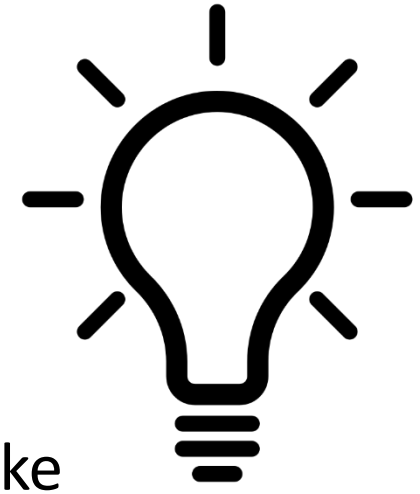


https://jupyterhub.github.io/nbgitpuller/

Try your own deployment: https://professorkazarinoff.github.io/jupyterhub-ENGR114-2019Q4/



Lessons Learned



- Authentication can be tricky. Linux does not like usernames with special characters
- A $5/month server works with a few users.
  25 users overloads a $5/month server.
  Use $40/month server for a class.
- Custom login page is possible, but takes work (html and css)
- Use a cull idle servers script to save resources
- Document! Document! Document!: You may want to spin up a new JupyterHub instance in the future.

Interested in a JupyterHub Deployment Tutorial?

Email:
peter.kazarinoff@pcc.edu
Twitter: @pkazarinoff

Questions?

- Slides: github.com/ProfessorKazarinoff/PyDataPDX-2019-11
- My JupyterHub Deployment Docs: https://professorkazarinoff.github.io/jupyterhub-ENGR114-2019Q4/
- JupyterHub Docs: https://jupyterhub.readthedocs.io/en/stable/
- nbgitpuller Plugin: https://jupyterhub.github.io/nbgitpuller/

I’m Looking for Guest Speakers!

- Share your experience with a community college class
- Email: peter.kazarinoff@pcc.edu or DM on Twitter @pkazarinoff