WORKSHOP + PRESENTATION
YALE UNIVERSITY INTERVIEW

SMOOTH SAILING

a seaborn primer using open health data

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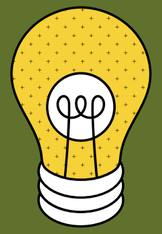
Quick-start, low-code methods for visualizing open health data.

Today, we're going to walk through the **lifecycle** of **selecting**, **filtering**, and **visualizing** a dataset with seaborn, a Python library.

This workshop is aimed at **anyone who wants to quickly get up and running with data analysis and exploration,** and is meant to be approachable for most levels.

Access the workshop GitHub repo:
https://github.com/kthrog/dataviz_workshop



OUTCOMES FOR TODAY'S SESSION

1 Access open health data

Learn where to find and how to access open health data created by U.S. government sources such as Centers for Disease Control and Prevention (CDC)

2 Use an API

Learn what an API is and how to use one, including functions like filtering and querying

3 Create visualizations

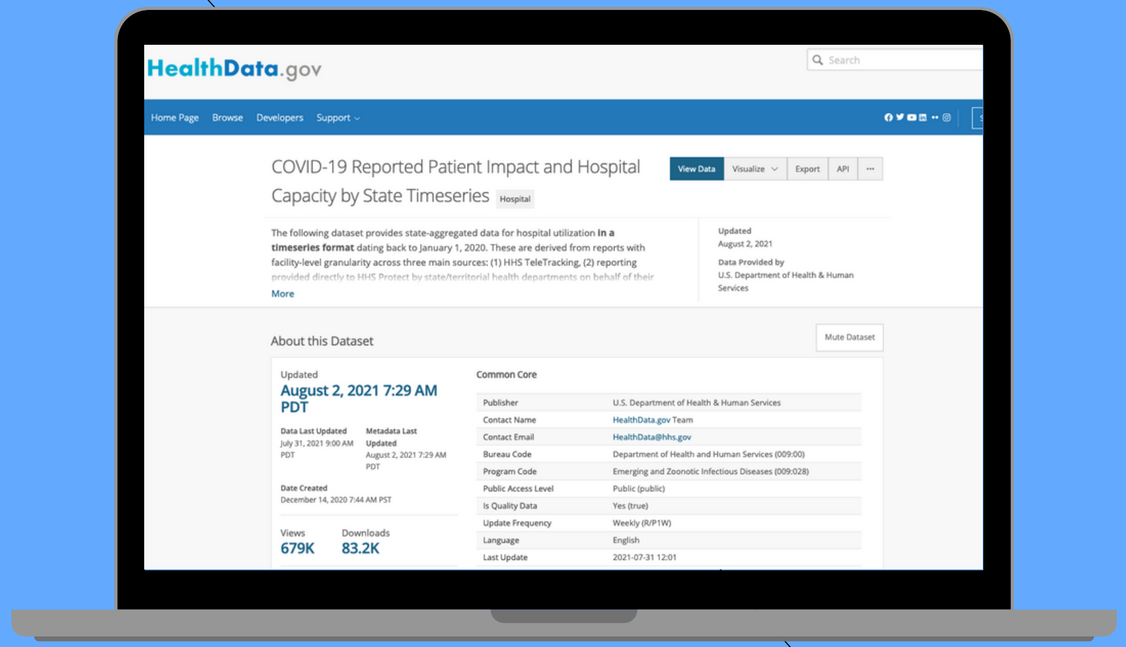
Visualize data with **seaborn**, an open-source Python library for attractive, informative statistical graphs

FINDING & ACCESSING OPEN HEALTH DATA

OPEN HEALTH DATA RESOURCES FROM THE U.S. GOVERNMENT

- data.gov
- healthdata.gov
- data.cdc.gov
- NIH-Supported Data Repositories
- ...and many more!

(Kim, 2019; Powell, 2021)



TODAY'S DATASET

COVID-19 Reported Patient Impact and Hospital Capacity by State Timeseries

healthdata.gov

(U.S. Department of Health & Human Services, 2020; Sainato, 2021)

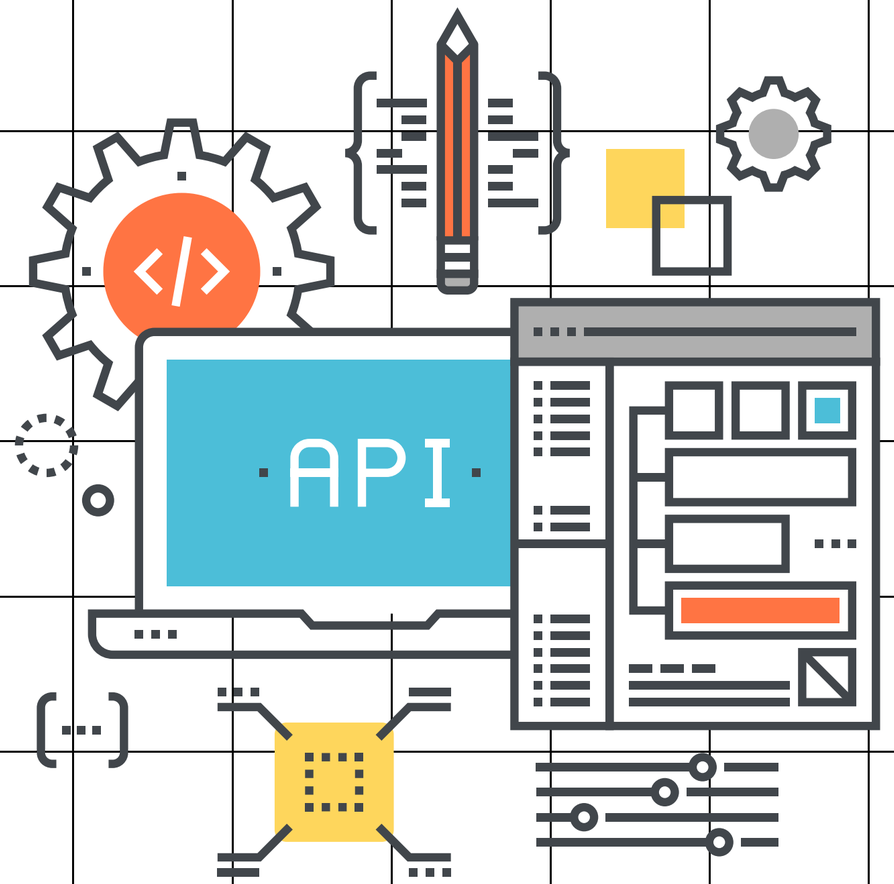
API FILTERING & QUERYING

WHAT'S AN API?

API stands for **A**pplication **P**rogramming **I**nterface.

APIs provide structured access to data; users then access the API's structured data via programmatic interfaces such as code or protocols.

When designed well, they can be a very powerful **data retrieval** and **manipulation** tool.



AN EXAMPLE: SOCRATA OPEN DATA API

The Socrata Platform

Many open government datasets are accessed via the Socrata data platform, including data.gov, cdc.data.gov, healthdata,gov, data.ct.gov

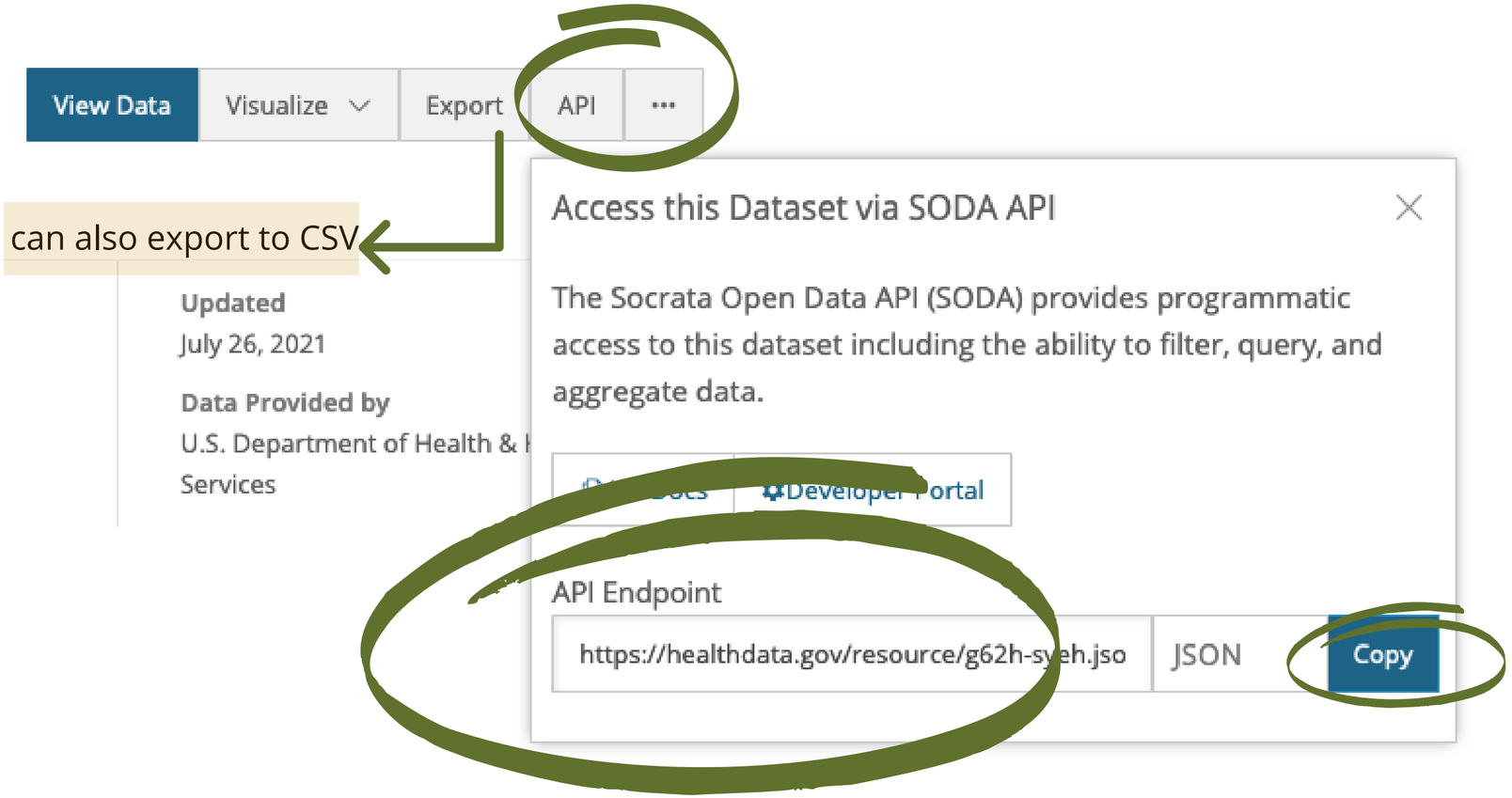
Socrata Open Data API (SODA)

Datasets on Socrata platforms can be filtered and queried using SODA; all communication with this API is conducted via HTTPS

(Tarkowska et al., 2018)

See resources + documentation section at end (or GitHub repo) for links to SODA documentation.

ACCESSING DATA VIA SODA



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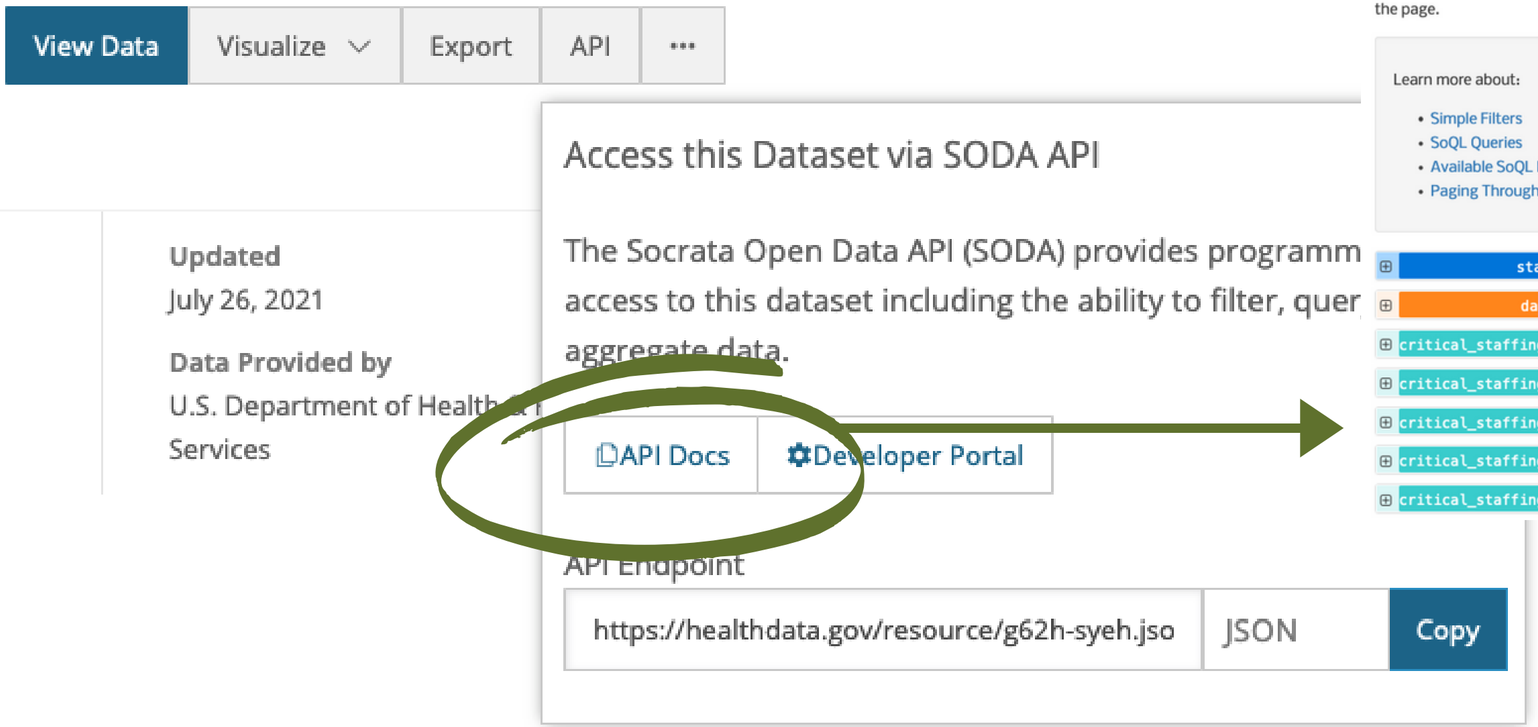
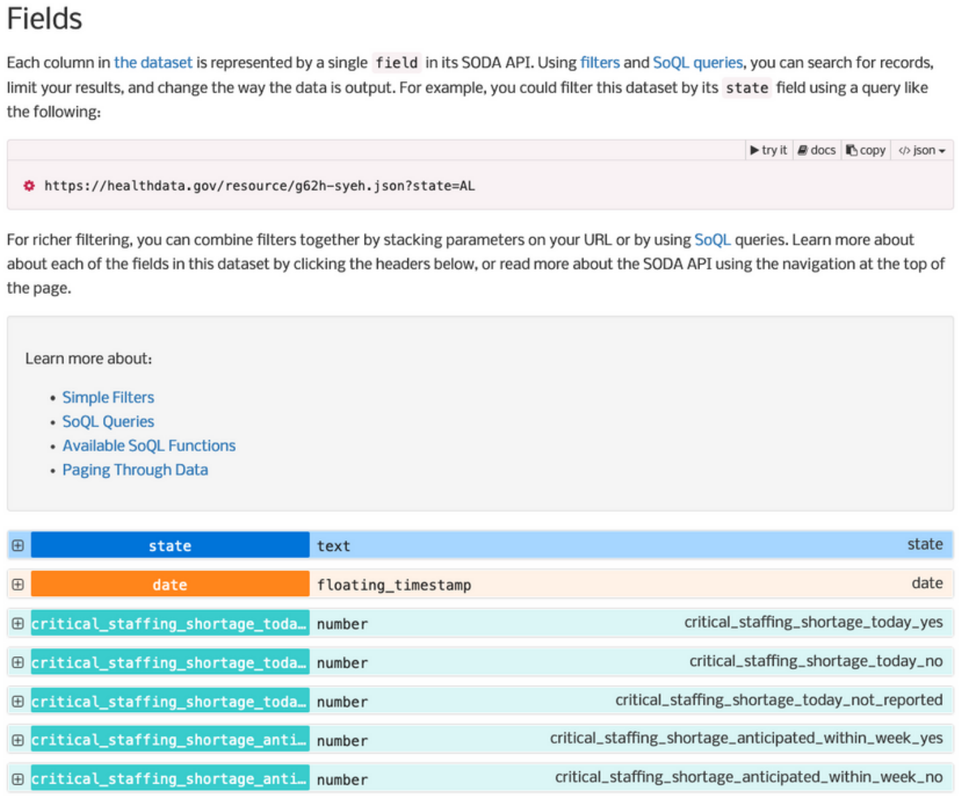




See resources + documentation section at end (or GitHub repo) for links to SODA documentation.

CONSTRUCTING API ENDPOINTS & ADDING FILTERS

https://healthdata.gov/resource/g62h-syeh.json

DATASET IDENTIFIER **RESPONSE TYPE (DATA FORMAT)**

KEY = VALUE

https://healthdata.gov/resource/g62h-syeh.json?state=CT

SIMPLE FILTER

See resources + documentation section at end (or GitHub repo)
for links to SODA documentation.

WRITING A SOQL QUERY

- Retrieve more (or less) rows than default (=1000) with **$limit** parameter

https://healthdata.gov/resource/g62h-syeh.json?$limit=50000

- Retrieve rows based on **date** variable with a **$where** parameter

KEY = VALUE RANGE

https://healthdata.gov/resource/g62h-syeh.json?
$where=date%20between%20%272020-11-
01T12:00:00%27%20and%20%272021-07-28T12:00:00%27

DATE RANGE = NOV' 2020 - JUL' 2021'

See resources + documentation section at end (or GitHub repo)
for links to SODA documentation.

WRITING A SOQL QUERY

- Chain these all together (use **&** to combine) to narrowly slice the data

https://healthdata.gov/resource/g62h-syeh.json?
$limit=50000&state=CT&$where=date%20between%20%272020-11-01T12:00:00%27%20and%20%272021-07-28T12:00:00%27

See resources + documentation section at end (or GitHub repo) for links to SODA documentation.

WHY USE AN API TO ACCESS DATA?

- "APIs…enhance adherence to FAIR data principles…"

(Tarkowska et al., 2018)

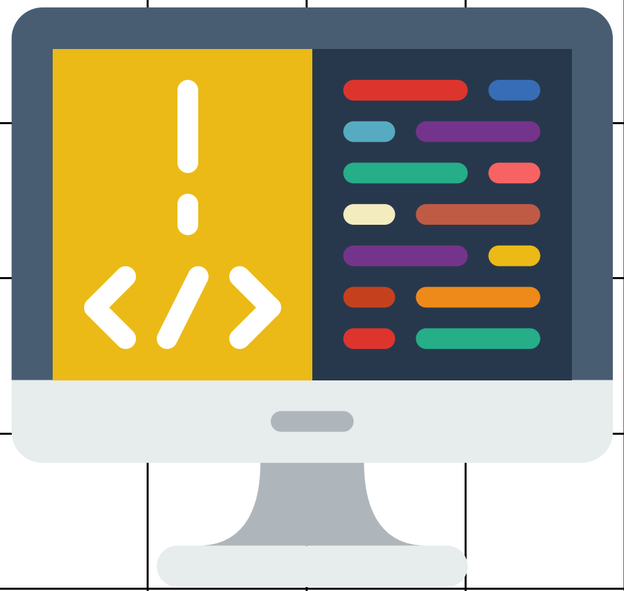
- Automated dataset updates
- Reduced storage and processing issues if filtering and querying performed in advance
- Sometimes, it's the only option a data repository offers!

VISUALIZING DATA WITH SEABORN

WHY USE SEABORN

- "Makes it easy to translate questions about data into graphics that can answer them"
- Excellent documentation
- Extensive gallery of attractive statistical graphs with many customization options
- Python library, built on pandas, scipy, and numpy, and meant as high-level interface for matplotlib

(Waskom, 2021)



WHAT WE'LL BE DOING

In a Jupyter notebook (a tool we'll be using to write, test, and run our code), we'll be using Python and several of its libraries to:

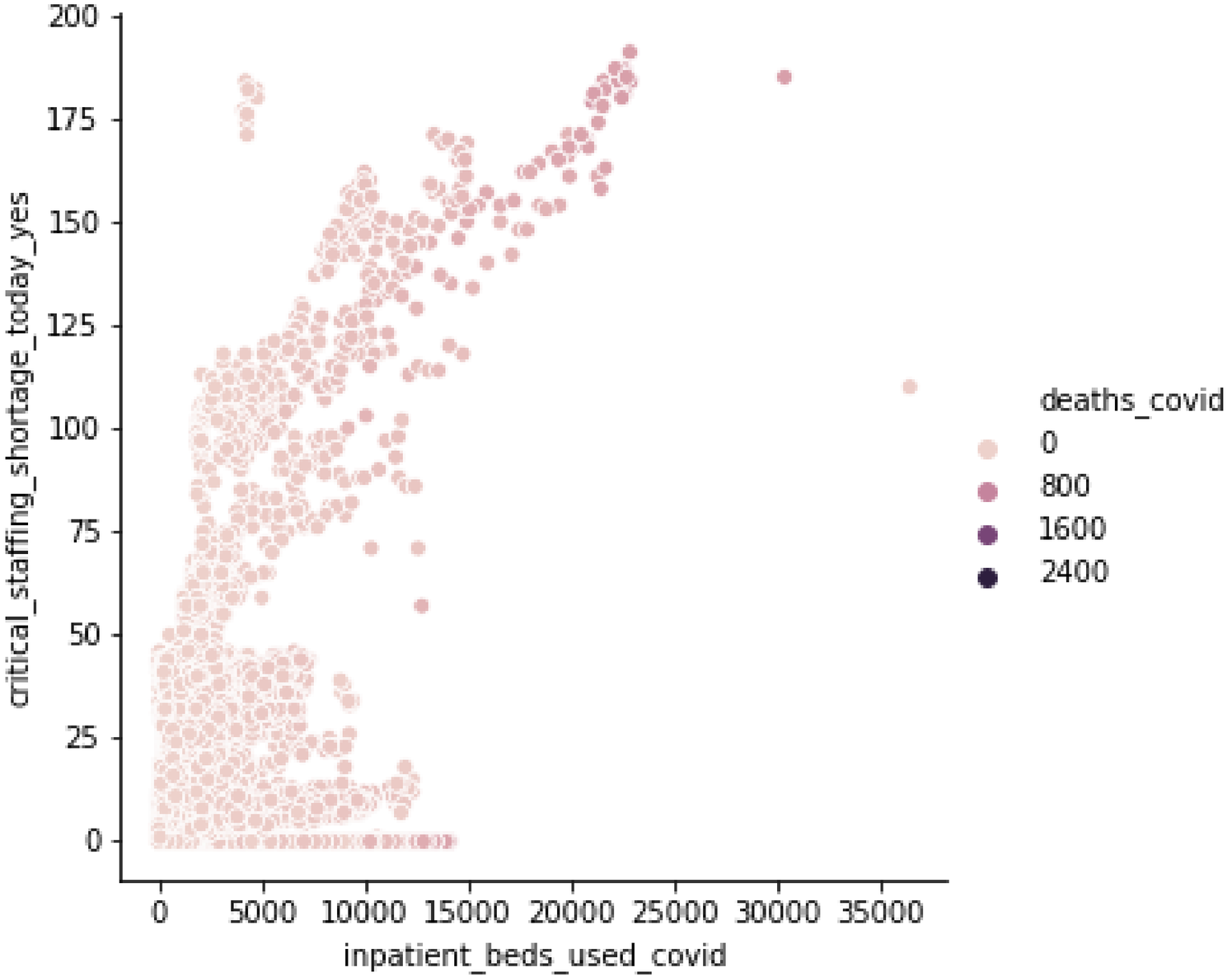
- Read data (API endpoint in JSON format) in as dataframe via pandas `pd.read_json()` function.
- Graph several charts in seaborn.

To clone the workshop GitHub repo, navigate to a directory where you want the files to be on your device, and type the following into a terminal window:

```
git clone https://github.com/kthrog/dataviz_workshop
```

LIVE DATA RESOURCE & CODE DEMO

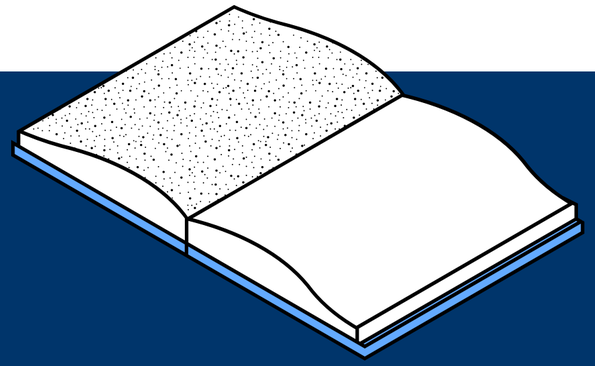
Follow along by downloading and using this Jupyter notebook:
https://github.com/kthrog/dataviz_workshop/blob/main/materials/seaborn_data_viz_blank_for_demo.ipynb

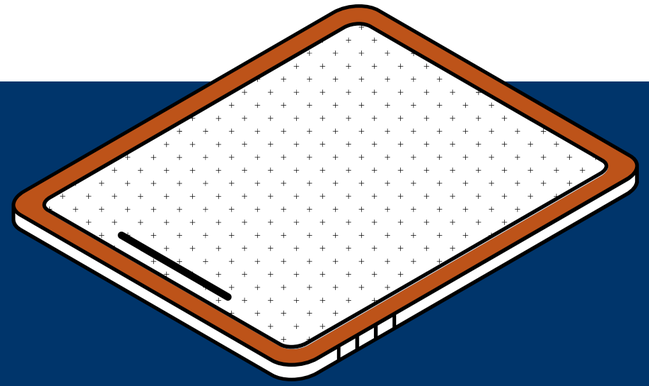


Final Figure.
Using DHHS data on U.S. hospitals, we've plotted inpatient beds occupied by COVID-19 patients versus whether a critical staffing shortage is occurring, with dots shaded by incidence of COVID-19 deaths.

POTENTIAL USE CASES

- Comparing your own data that you've generated to a larger dataset — e.g., if you had access to Yale Hospital's staffing and COVID inpatient bed usage, you could compare those numbers to these national ones
- Exploring public data you're interested in, quickly, to see if you actually want to interact with / download the full dataset
- Practicing data viz!





HOW ELSE MIGHT YOU USE THIS KNOWLEDGE IN YOUR STUDIES, RESEARCH, OR WORK?

THANK YOU!

REFERENCES

Kim, H. (2019). Data.gov at Ten and the OPEN Government Data Act. Data.gov. https://www.data.gov/meta/data-gov-at-ten-and-the-open-government-data-act/

Powell, K. (2021). The broken promise that undermines human genome research. Nature 590, 198-201. https://doi.org/10.1038/d41586-021-00331-5

Sainato, M. (2021). 'We went from heroes to zeroes': US nurses strike over work conditions. *The Guardian.* https://www.theguardian.com/society/2021/jul/30/us-nurses-strike-covid-coronavirus-conditions-understaffing

Tarkowska, A., Carvalho-Silva, D., Cook, C.E., Turner, E., Finn, R.D., Yates, A.D. (2018). Eleven quick tips to build a usable REST API for life sciences. PLoS Computational Biology 14(12): e1006542. https://doi.org/10.1371/journal.pcbi.1006542

U.S. Department of Health & Human Services. (2020). COVID-19 Reported Patient Impact and Hospital Capacity by State Timeseries. https://healthdata.gov/Hospital/COVID-19-Reported-Patient-Impact-and-Hospital-Capa/g62h-syeh

Waskom, M. L., (2021). seaborn: statistical data visualization. Journal of Open Source Software, 6(60), 3021. https://doi.org/10.21105/joss.03021

RESOURCES & DOCUMENTATION

RESOURCES:

Workshop GitHub Repo

https://github.com/kthrog/dataviz_workshop

Data

https://www.data.gov/
https://www.healthdata.gov/
https://data.cdc.gov/
https://data.cdc.gov/browse
https://www.nlm.nih.gov/NIHbmic/nih_data_sharing_repositories.html

Visualization

10 Simple Rules for Better Figures | *PLOS Comp Bio*
https://doi.org/10.1371/journal.pcbi.1003833

How to Choose the Right Data Visualization | *Chartio*
https://chartio.com/learn/charts/how-to-choose-data-visualization/

DOCUMENTATION:

Python

https://www.python.org/

Jupyter Notebook

https://jupyter-notebook.readthedocs.io/en/stable/notebook.html#introduction

Socrata Open Data API (SODA)

https://dev.socrata.com/

Seaborn

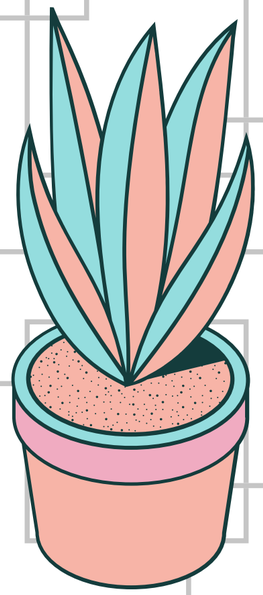
https://seaborn.pydata.org/

Pandas

https://pandas.pydata.org/

For full list of resources, references, and documentation:
https://github.com/kthrog/dataviz_workshop/edit/main/materials/resources.md

RATIONALE FOR WORKSHOP DECISIONS

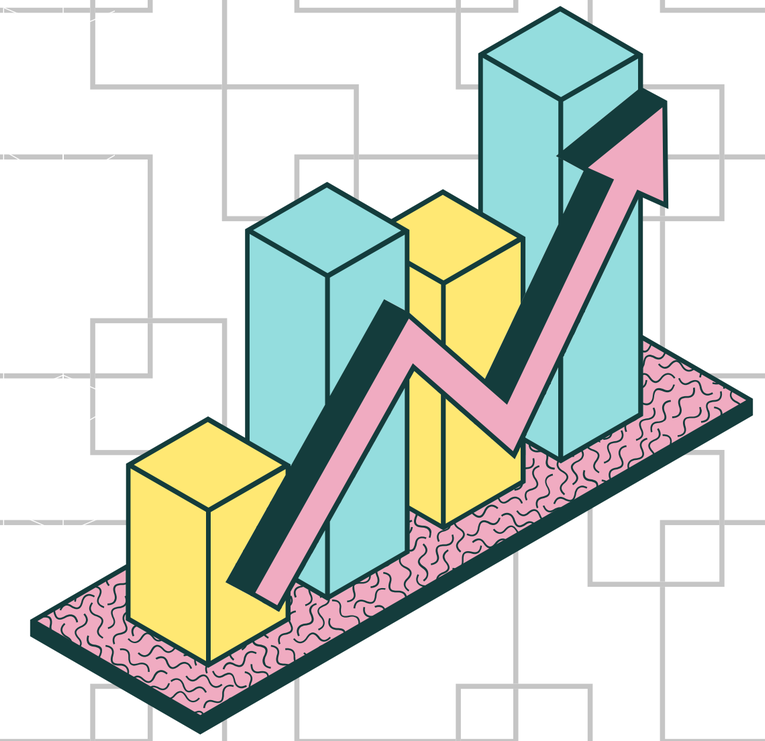


MAIN ETHOS

- Keep it approachable, applicable, and user-focused
- Cultivate a growth mindset
- Take any opportunity to boost literacy
- Stoke curiosity and enthusiasm

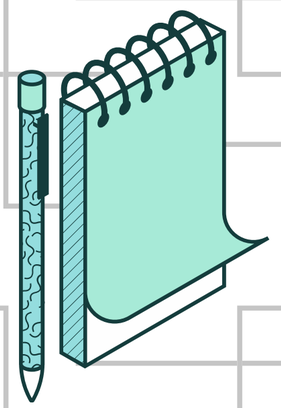
WHY: TOPIC

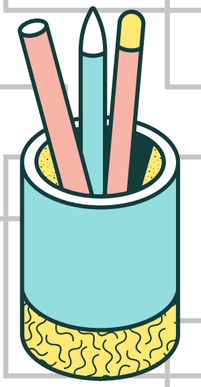
- Chose multi-part topic in order to give learners full snapshot of process, from dataset acquisition to visualization
- seaborn seemed perfect for this short format – with its single function call for plotting

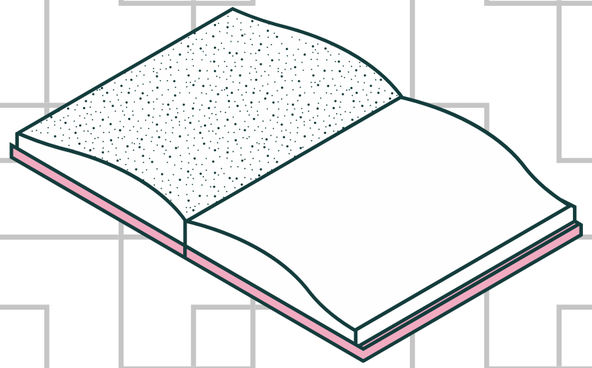


METHODS & DEVELOPMENT

- Used backwards course design to develop
- Wanted multi-layered session approachable to multiple levels
- Live coding inspired by Software Carpentry approach

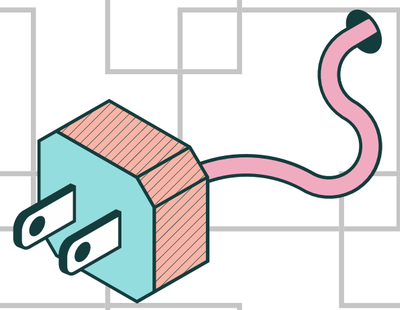






OTHER NOTES

- In a non-interview scenario, I would:
  - Send tool installation instructions in advance
  - Assess before and after session
  - Incorporate multiple activities and more discussion questions (though I might need a bit more time to do this well)
  - Test session (especially notebook demos) on multiple device types (e.g., PC, Chromebook, iPad, etc.)



THANK YOU!

QUESTIONS?