

# PROGRAMMING WITH PYTHON



**BUILD YOUR SKILLS**  
WORKSHOP SERIES

[GO.GWU.EDU/LIBWORKSHOPS](https://go.gwu.edu/libworkshops)

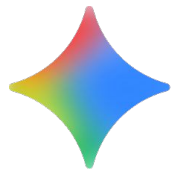
# Objectives

- Gain familiarity with one environment for using Python (Google Colab), and awareness of others
- Learn Python language basics
- Learn how to look things up, how to interpret errors
- Gain confidence to try things we didn't learn today!

# What about AI?!



# Claude



# Gemini



# CURSOR



Feb  
12

Workshop

Thu 12PM - 2PM

[Using A.I. for Quantitative Data  
Analysis: Tools, Ethics, and Effective  
Practices](#)

Explore how A.I. can support quantitative data analysis, from data cleaning and visualization to drawing inferences and generating insights.



# What about AI?!

Two things you will want to eventually learn how to do:

1. Use AI effectively as a companion to help you write code



| Start coding or generate with AI.

2. Write **code that uses AI models** to accomplish things

Access Popular LLMs via Google-Colab-AI Without an API Key

Users with Colab's paid plans have free access to most popular LLMs via google-colab-ai Python library. For more details, refer to the [getting started with google colab ai](#).

```
from google.colab import ai
response = ai.generate_text("What is the capital of France?")
print(response)
```

# Why Python?



- Free
- General purpose
- Easy to learn
- Readable\*
- Community–developed / Open Source
- Widely used and documented
- Good built–in and contributed **libraries**

# Different ways to use Python



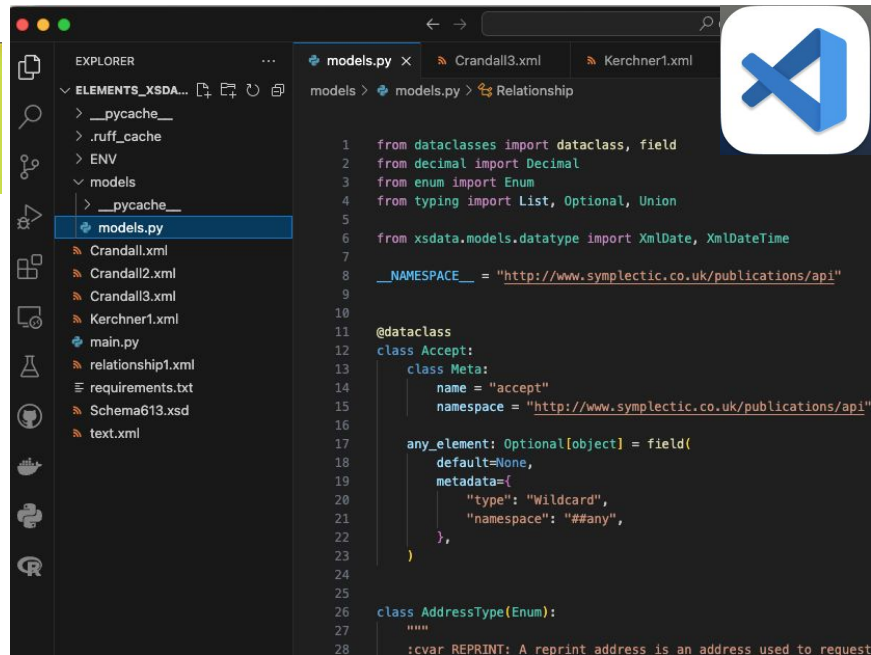
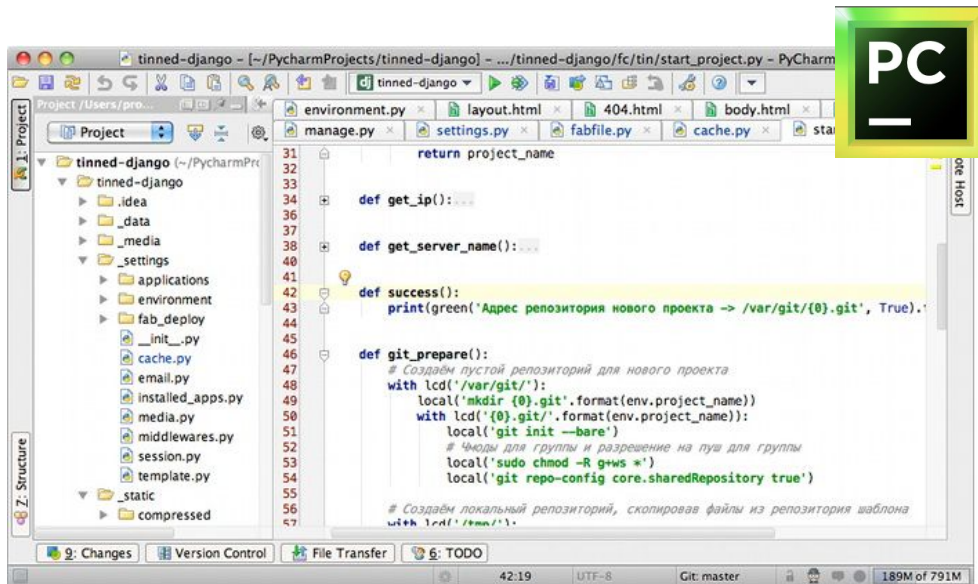
- Command line/REPL

```
Python 3.11.2 (v3.11.2:878ead1ac1, Feb 7 2023, 10:02:41) [Clang 13.0.0 (clang-1300.0.29.30)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>>
>>> opinion = "This workshop is awful!"
>>> opinion == True
False
>>> █
```

# Different ways to use Python

Integrated Development Environment (IDE)

[pyCharm](#), [VSCode](#), ...



## "Python Notebooks"

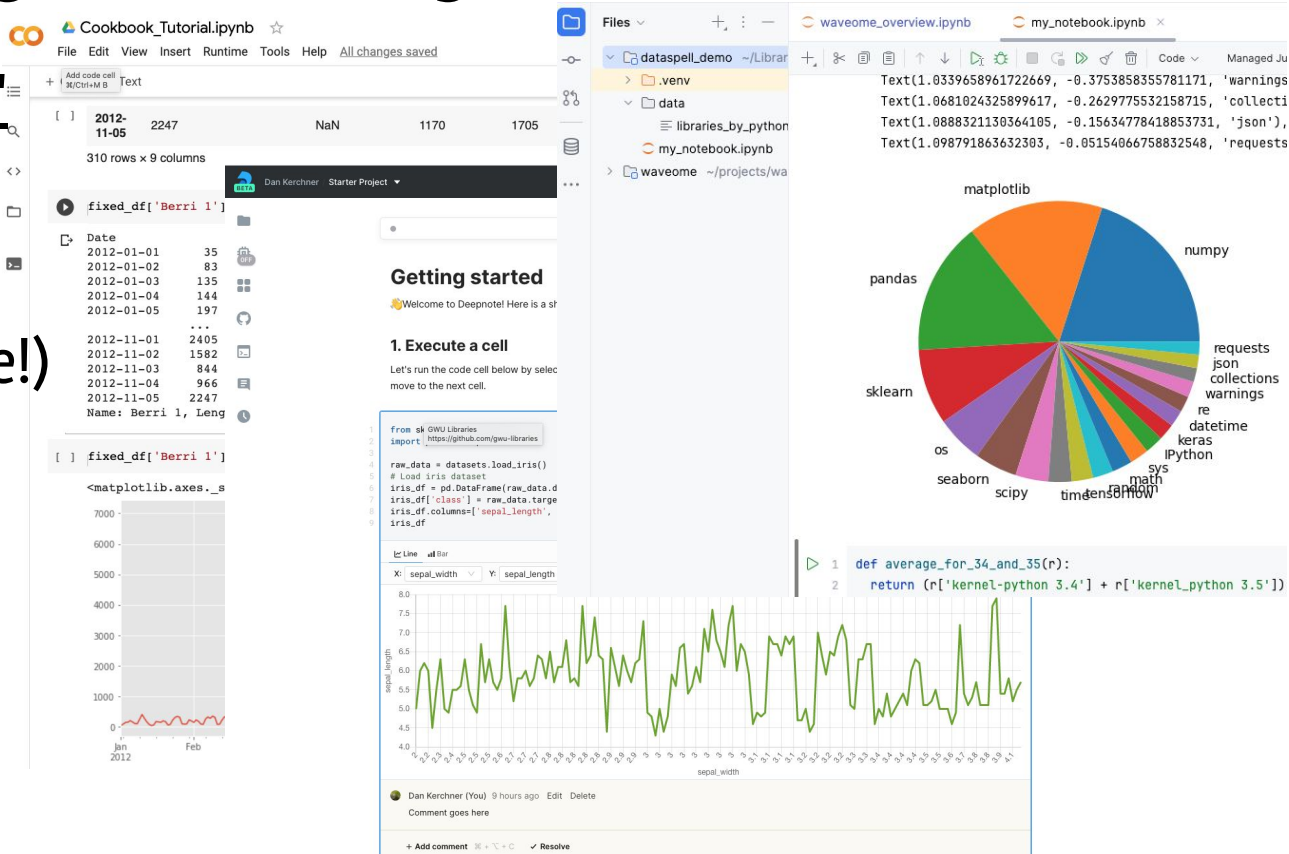
## Google Colab

(in your Google Drive!)

# DataSpell

## Kaggle

## Deepnote





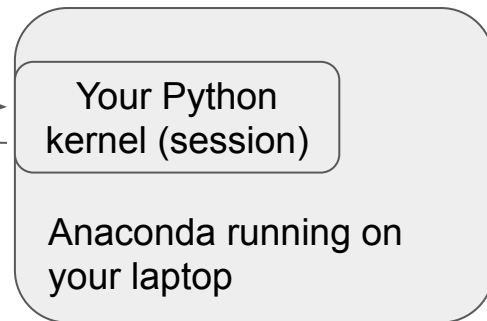
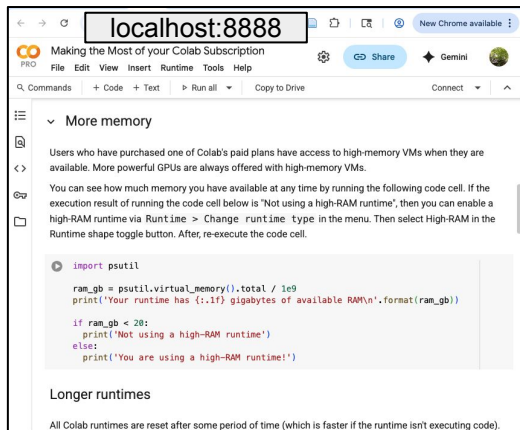
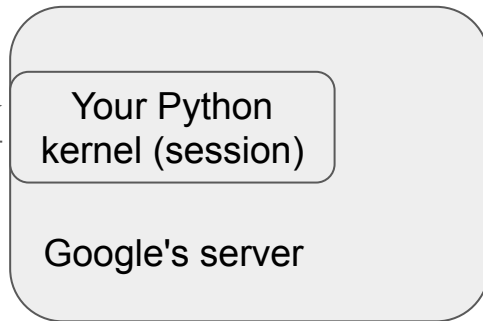
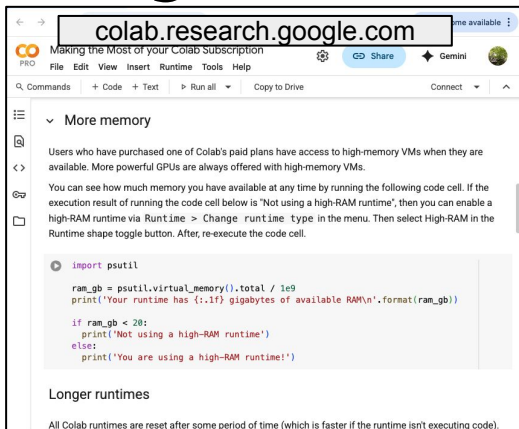
# Even more ways to use Python

Anaconda = Python (and R) plus:

- **Jupyter notebooks**
- lots of libraries
  - data science
  - analytics
  - scientific computing
  - including:
    - Polars** and **Panda**
  - (for working with data frames)

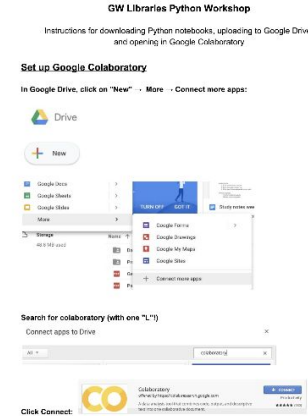


# When you use a Python notebook...



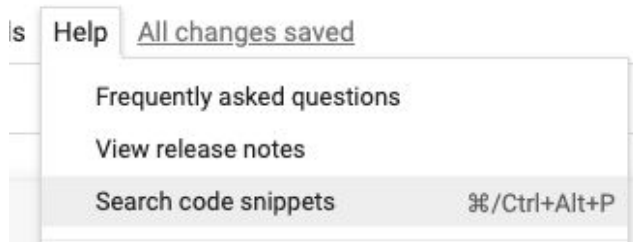
# Setup

- Google Colaboratory  
[colab.research.google.com](https://colab.research.google.com)



*\* To do later:* If you aren't already seeing this  , then sign up for [free] Google Colab Pro for Education!  
[colab.research.google.com/signup](https://colab.research.google.com/signup)

# Uploading Data (and doing other things) in Google Colab



Code snippets ✕

Filter code snippets

upload

- Open files from your local file system +
- Saving data to Google Drive +
- Saving data with gsutil +
- Saving data with the Cloud Storage Python API +

Open files from your local file system [Insert](#)

files.upload returns a dictionary of the files which were uploaded. The dictionary is keyed by the file name, the value is the data which was uploaded.


```
from google.colab import files

uploaded = files.upload()

for fn in uploaded.keys():
    print('User uploaded file "{name}" with length {length}'.format(name=fn, length=len(uploaded[fn])))
```

Use "Code Snippets" (searchable!) →

# Some recommendations

- Write assuming your code will be read (incl. by Future You)
- Version your code  **GitHub**
- Learn to be "Pythonic" in your style
- Isolate your projects from each other
  - Use venv, conda, and/or pixi.sh
- Stuck? Try an Internet search
- Which version of Python are you using?
- Find good code examples and make them work
- Keep learning!

# Some Python libraries/frameworks

Building web applications	Django Flask
Scientific/numerical	Numpy Scipy Pandas
Machine Learning	scikit-learn, tensorflow
Data Visualization (check out <a href="http://www.python-graph-gallery.com">www.python-graph-gallery.com</a> )	matplotlib bokeh ggplot (like ggplot2 in R) plotly (<- interactive) seaborn

# Things we learned today in Python that most coding languages also share (Part 1)

- variables
- different data types: numeric, text, logical, etc.
- data structures for holding more than a single value: lists/arrays/matrices/etc.
- loops
- conditional logic (if/then)
- functions
- libraries/packages for bringing in extra functionality

# Data analysis you can perform using Pandas

- loading in (reading in) a data set
- subsetting based on columns and/or rows based on data criteria
- exploring data variables, both numerical and text/categorical
- merging/joining data frames
- plotting data (e.g., with matplotlib and with ggplot2)



# To Learn More

- PyFlo [pyflo.net](http://pyflo.net) ← NEW!
- Kaggle: [kaggle.com/learn](http://kaggle.com/learn)
- [learnpython.org](http://learnpython.org)
- [Software Carpentry](http://SoftwareCarpentry.org), [Data Carpentry](http://DataCarpentry.org) (not just Python)
- [docs.python.org/3/tutorial](http://docs.python.org/3/tutorial) (and [docs.python.org](http://docs.python.org))
- [GW Online: Get data off the ground with Python](http://GWOnline.org)
- [Upcoming Python workshops @ GW Libraries](http://UpcomingPythonworkshops.org)
- LinkedIn learning [it.gwu.edu/linkedin-learning](http://it.gwu.edu/linkedin-learning) courses
  - 253 Python, 6 Pandas
- More on Pandas:
  - Pandas cookbook: [github.com/jvns/pandas-cookbook](http://github.com/jvns/pandas-cookbook)
  - [pandas.pydata.org/pandas-docs/stable/10min.html](http://pandas.pydata.org/pandas-docs/stable/10min.html)
  - [pandas.pydata.org/pandas-docs/stable/tutorials.html](http://pandas.pydata.org/pandas-docs/stable/tutorials.html)
  - [pandas.pydata.org/pandas-docs/stable/cookbook.html](http://pandas.pydata.org/pandas-docs/stable/cookbook.html)
  - [www.datacarpentry.org/python-ecology-lesson/](http://www.datacarpentry.org/python-ecology-lesson/)

# Contact us:

## Coding Consultations (with Dan & colleagues):

[calendly.com/gwul-coding](https://calendly.com/gwul-coding) – Python, R, HTML/CSS/JavaScript

## Stats Appointments (with Stats grad students):

[go.gwu.edu/dataconsulting](https://go.gwu.edu/dataconsulting)

Workshop Materials: [go.gwu.edu/pyw](https://go.gwu.edu/pyw)  
[kerchner@gwu.edu](mailto:kerchner@gwu.edu)