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HCI Initiative

COMP 4462
Data Visualization Tutorial

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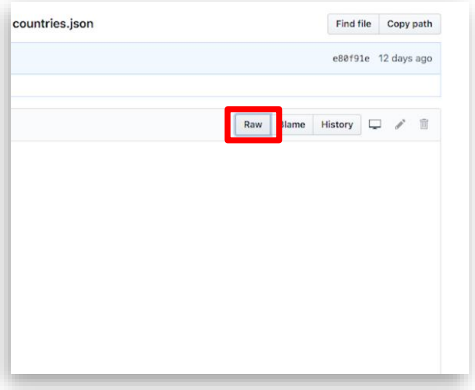
Python, Jupyter Notebook and Google Colab

- Python
  - Interpreted language (i.e. run line by line, no compilation)
  - Dynamic typing (i.e. do not need to declare types like int, float, char*, etc.)
  - Easy to pick up, widely used, a lot of learning resources online
  - A lot of libraries, fast and powerful
    - Pandas, scikit-learn, matplotlib, altair and a lot of deep learning related libraries
- Jupyter Notebook
  - Interactive environment (i.e. you know exactly what it does)
  - Design for experimentation
    - Just like a notebook in laboratory, recoding every steps of experiment and results
    - Form hypothesis (setup code) => experiment (run code) => see results (code output) => refine hypothesis (change code) => experiment again (run code again) => results => loop
- Google Colab
  - A hosted version of Jupyter Notebook
  - Provided by Google, free!

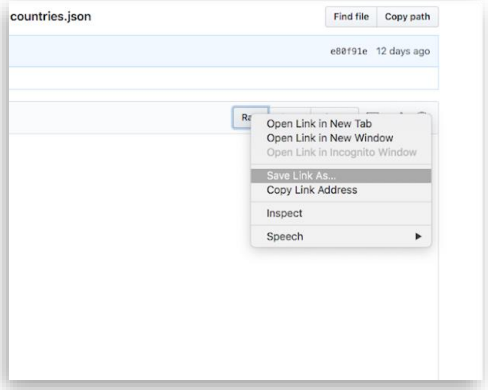
Download dataset from GitHub

1. Go to the tutorial repository
2. Go to the dataset file you want download, e.g. pokemon.csv

3. Right click “Raw”



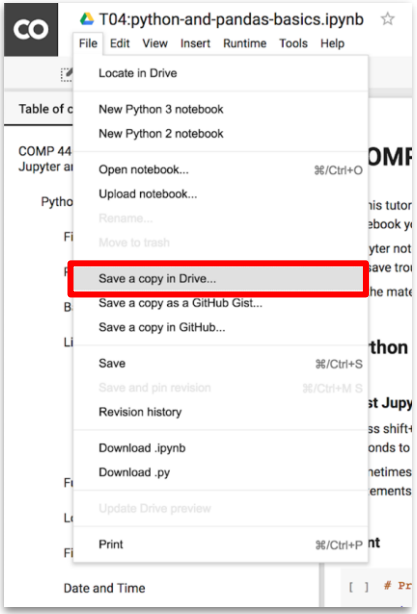
4. Save as file



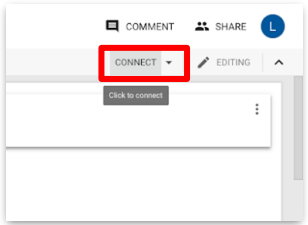
Google Colab

1. Sign in your Google account
2. Go to the [notebook of this tutorial]

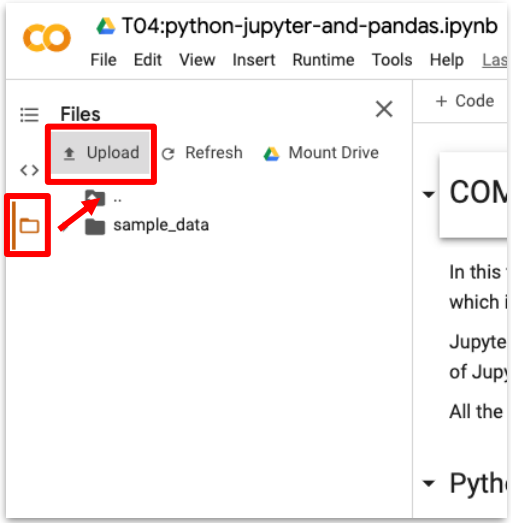
3. Make a copy



4. Connect

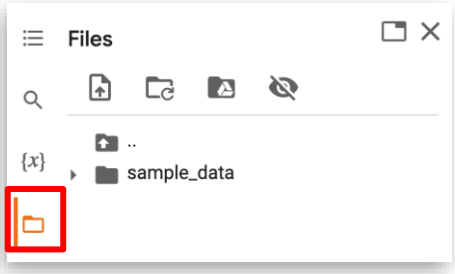


5. Upload dataset

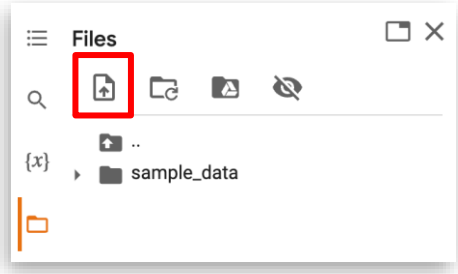


Upload dataset to Colab

1. Switch to “Files”



2. Click the “Upload” button



3. Select the dataset file you want to upload, e.g. pokemon.csv.
4. You may load the dataset with Pandas using `pd.read_csv()`.

Python / Jupyter Notebook Basics

- See the Jupyter notebook on Google Colab
- Topics:
  - Print statement / comments / shift-enter / Tab completion
  - Data type / string / numeric / booleans / string to int / None
  - List (retrieve / add / remove / combine / sort) / dict / set / tuple / unpack
  - List / set / dict comprehensions
  - Logic flow / loop / range
  - Define function / call function / named arguments / return value(s)
  - Module loading
  - File read / write
  - Dates and times
  - Basic pandas usage
  - Plotting with pandas
  - Scikit-learn with pandas

Lab exercise

- Tasks
  - Open this Google Colab notebook, make a copy and connect
  - Read through “Python and Jupyter Basics” and fill in the “TODO” cells
  - Complete the following tasks in the same Jupyter notebook:
    - Download Pokemon dataset (pokemon.csv) from GitHub
    - Upload the dataset to Google Colab workspace
    - Read dataset using pandas
    - Print the loaded dataframe to output
    - Sort the dataframe by “base_total” and print to output
    - Plot with “.plot()” function of pandas dataframe
    - How to submit: **print the whole web page as .pdf and upload to Canvas**
      - Mac: cmd+p
      - Windows: ctrl+p
- Optional
  - If you like this tutorial so far, star our GitHub repository ⭐ ⭐ ⭐ Thank you! 💖
  - Explore the Pokemon dataset, we will revisit it again in later tutorials

More topics on Python / Jupyter / Pandas

- **A lot** more Python language features
  - Lambda, partial argument, spread operator, zip, dict <=> lists, nested comprehensions, namespaces, class and inheritance, variable scope, positional arguments, keyword arguments, generator, iterator
  - Standard libraries
    - Regular Expressions, urllib, itertools, functools
  - Common libraries
    - Joblib, scikit-learn, numpy
  - And **a lot** more...
- More Jupyter features
  - JupyterLab, shortcuts, magic commands, extensions
- More Pandas features
  - Summary / clean data / handle null values
  - Data selection / filter
  - Sort / groupby / aggregate
  - Join dataframes
  - ...

Next tutorial

Where to find visualizations and interesting datasets?

- We will have:
  - Project Proposal Consultation
  - In-Class Exercise Review