Week 03: Python Libraries

Data Science Bootcamp
Fall, 2021

Instructor: Sagar Patel

Communities

- Join the **Slack** community to not miss out on any announcements and updates
  Link: **https://join.slack.com/t/nyudatascienc-dhl1701/shared_invite/zt-vtnexwra-G7IbQOyg00qNND2bdXlYTQ**
- Share your **GitHub** Username on **#general** to be added to the NYU Data Science Bootcamp Organization where all the resources and tasks will be available after each session
  - If you do not have a GitHub account, create one!
- You can also email us at **datasciencebootcamp@nyu.edu**

Where are we?

Week 1 — **Introduction**

Introduction to Python; Getting started with Git and GitHub

Week 2 — **SQL**

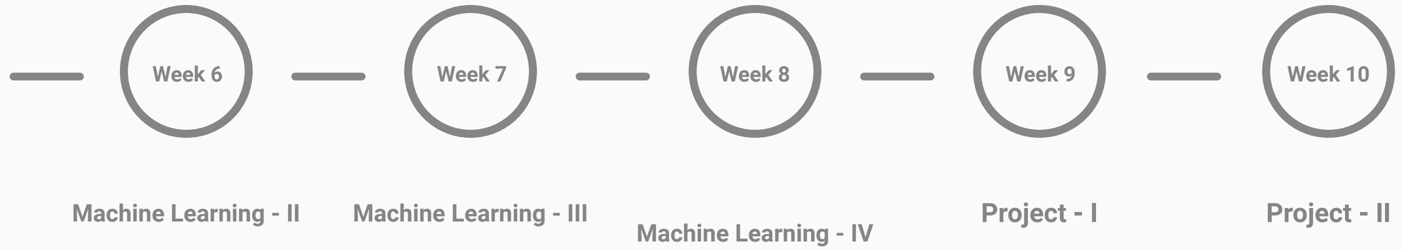
Relational databases; Selecting, joining and updating tables using SQL

Week 3 — **Python Libraries**

Week 4 — **Exploratory Data Analysis**

Week 5 — **Machine Learning - I**

Where are we?


Week 6
Machine Learning - II
Week 7
Machine Learning - III
Week 8
Machine Learning - IV
Week 9
Project - I
Week 10
Project - II

slido

Name a few python libraries

ⓘ Start presenting to display the poll results on this slide.

Agenda

- The most common libraries in Python
  - Numpy
  - Pandas
- Data Visualization
  - Matplotlib
  - Seaborn

What are packages?

- In order to organize modules in Python, **packages** were introduced
- Kinda like **directories** on a file system, and modules as files within those directories

- Installing a package in Python
  - **pip install <package name>**
  - Example: **pip install pandas**

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NOTE: Depending on the version of pip installed, you might want to switch between **pip** and **pip3**

Libraries in Python

- A reusable chunk of code that you may want to include your program/projects
- Compared to C++ or C, Python libraries do not pertain to any specific **context** in Python

- To use libraries in the program, we need to import them!
  - Preferably done at the start of the program or the notebook
  - **import <module / library> as *<variable>***

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JUST FOR FUN!
To list all packages installed in Python:
- help(“modules”)

Numpy and Pandas

Numpy

- Provides **fast** mathematical computation on arrays and matrices
- Numpy also provides the essential multi-dimensional array-oriented computing functionalities designed for high-level mathematical functions and scientific computation

- The main object of Numpy is the **homogenous multidimensional array**
  - Table(/list) with **same** type of elements, usually integers
  - Example: **a = np.array([1, 2, 3])**

Attributes of Numpy

● **ndim**	⇐ displays the dimension of the array
● **shape**	⇐ returns a tuple indicating size of array
● **size**	⇐ total number of elements in the array
● **dtype**	⇐ returns the type of elements
● **itemsize**	⇐ size in bytes of each item
● **reshape**	⇐ reshapes the array

Numpy documentation: https://numpy.org/

Understanding Pandas

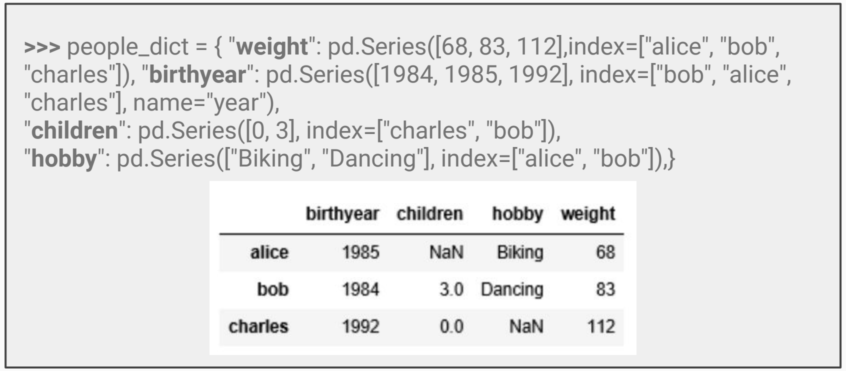
- Unlike **Numpy**, **Pandas** provides provides in-memory 2-D table object called **“Dataframe”**

- Dataframes are like a spreadsheet with column names and row labels!
  - Pandas can be used to create pivot tables, computing column based operations, etc.
  - Data which can be used for plotting graphs

Pandas “Series” object

- In a dataframe, each row is provided with an index
  - By default, they are assigned numerical values starting from 0
- A dataframe can be visualized as **dictionaries of Series**

- How do we declare it?
  - **pd.Series([val1, val2, …, valn])**



```
>>> people_dict = { "weight": pd.Series([68, 83, 112],index=["alice", "bob",
"charles"]), "birthyear": pd.Series([1984, 1985, 1992], index=["bob", "alice",
"charles"], name="year"),
"children": pd.Series([0, 3], index=["charles", "bob"]),
"hobby": pd.Series(["Biking", "Dancing"], index=["alice", "bob"]),}
```

	birthyear	children	hobby	weight
alice	1985	NaN	Biking	68
bob	1984	3.0	Dancing	83
charles	1992	0.0	NaN	112

What to use when working with dataframes?

● **head()**	⇐ returns the top 5 rows in the object
● **tail()**	⇐ returns the bottom 5 rows in the dataframe
● **info()**	⇐ summary of the dataframe
● **describe()**	⇐ overview of the aggregated values

Documentation can be found here https://pandas.pydata.org/

Data Visualization

What is matplotlib?

- **matplotlib** is a 2D **plotting library**
- Can be used in Python scripts, Python shell, notebooks and web applications

- **matplotlib.pyplot** makes matplotlib work like **MATLAB**
    - If you are familiar with MATLAB, the commands are fairly intuitive

- Documentation can be found at https://matplotlib.org/

Seaborn: statistical data visualization

- Based on **matplotlib**, seaborn is a Python data visualization library
    - Integrates closely with **Pandas** data structures

- Seaborn documentation: https://seaborn.pydata.org/

matplotlib vs seaborn

- seaborn utilizes **fascinating themes**, while matplotlib is used for **basic graphs**
- matplotlib is profoundly **robust and customizable**, seaborn is not (entirely)!
- seaborn is more **agreeable** in taking care of dataframes in Pandas
  matplotlib, with both Pandas and Numpy goes about as a **graphics package** for Python

Summary

- Numpy and Pandas make matrix multiplication easy
    - This makes them very useful for Machine Learning model development
- The utilization of seaborn or matplotlib exclusively relies on the motivation of plotting
- However, seaborn is more aesthetic!

That’s all Folks!

See you in the next session :)

Give us a feedback: https://bit.ly/3EX8MYh