Discrete Structures!

CMPSC 102

Setting Up Projects

ALLEGHENY COLLEGE

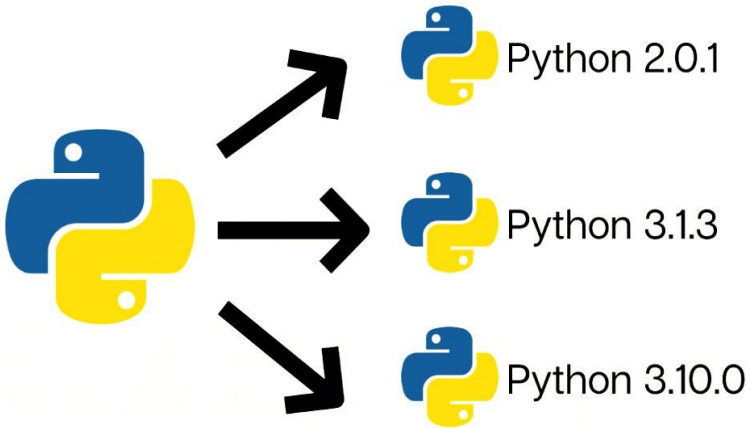
Key Questions and Learning Objectives

- How do I use virtual environments like Venv and Poetry, along with tools like Typer and other resources, to create a professional Python project?

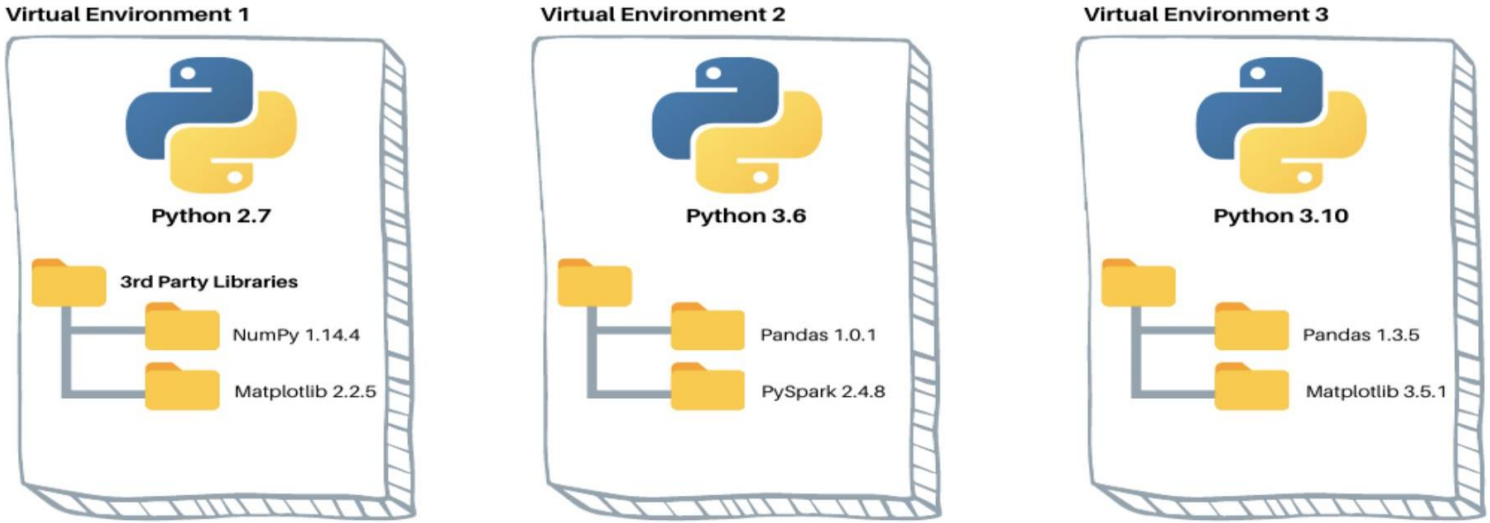
- To learn how to use libraries and dependencies for development with Python code and programming techniques to create the foundations for a professional project.

Virtual Environments

- Projects' dependencies and specific versions of libraries.
- Not all projects require the same dependencies; How do you mix projects on your computer?



Go Virtual



- Virtual environments maintain specific libraries and dependencies projects
- Shipping software: build an exact copy of development environment on client's machine to use software.

Regression Analysis Project

- Decide on the purpose and composition of the project
  - Our project: a regression analysis demonstration from SciKit-Learn
    - https://scikit-learn.org/stable/supervised_learning.html#
  - No command line parameters
  - No output, other than screen printing
  - Execution: Program complete regression analysis of random values
  - One function in project: main()
  - **Dependencies**: scikit-learn, numpy, seaborn

Setting Up Virtual Environment

- Create a project directory

```
mkdir projects
cd projects
```

- Create virtual environment using Python

```
python3 -m venv myenv
# see the file tree
find . -not -path '*/\.*'
```

- Activate myenv the virtual environment

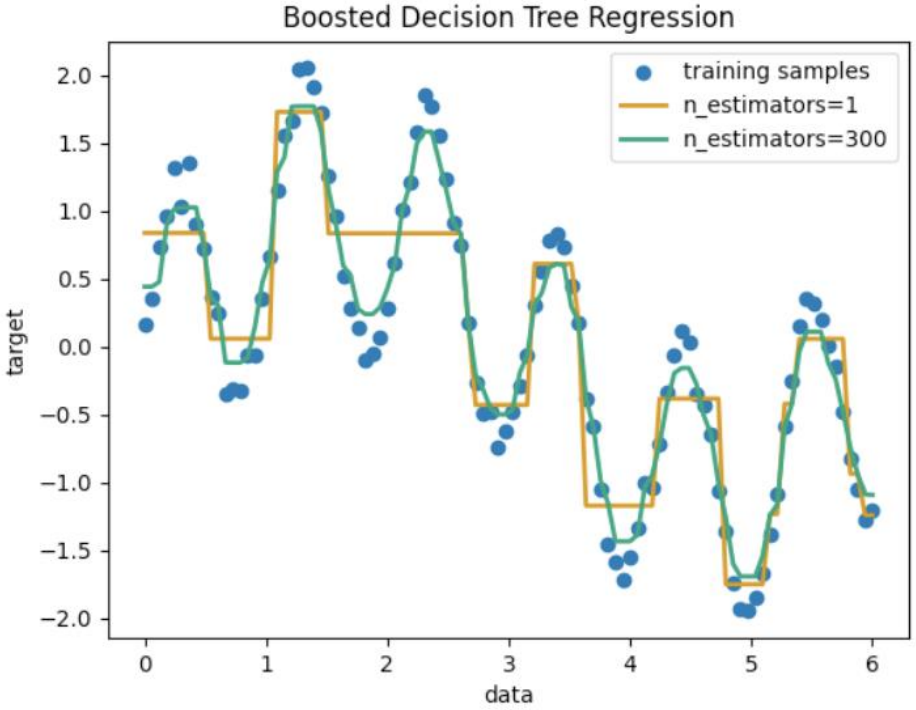
```
source myenv/bin/activate  # macOS/Linux
myenv\Scripts\activate     # Windows
```

- Install Dependencies

```
pip install numpy
pip install seaborn
pip install scikit-learn
# or try: pip install sklearn
```

Output From Executing the Script

- Execute given Script in myenv : Python3 sciKitDemo.py



Black: a Python Script formatter

Got Clutter?

- How to maintain *readable* code?
- How to reduce white-space in code to improve readability?

- A code formatting resource
- https://black.readthedocs.io/en/stable/getting_started.html

Black: a Python Script formatter

- Install Dependencies

```
pip install black
```

- Linting example: As a String to Printed Line

```
black --code "print ( 'hello, world'       )"
```

- Linting example: Standard Input to File

```
echo "print ( 'hello, world' )" | black - > out.txt
```

https://black.readthedocs.io/en/stable/usage_and_configuration/the_basics.html

- We will use this with Poetry (up next)

We Need Poetry!!

Work without Hope, by Samuel Taylor Coleridge Lines Composed 21st February 1825

All Nature seems at work. Slugs leave their lair The bees are stirringbirds are on the wing
And Winter slumbering in the open air, Wears on his smiling face a dream of Spring! And I the while, the sole unbusy thing,
Nor honey make, nor pair, nor build, nor sing.

Yet well I ken the banks where amaranths blow,
Have traced the fount whence streams of nectar flow.
Bloom, O ye amaranths! bloom for whom ye may, For me ye bloom not! Glide, rich streams, away!
With lips unbrightened, wreathless brow, I stroll: And would you learn the spells that drowse my soul? Work without Hope draws nectar in a sieve,
And Hope without an object cannot live.

A Bigger Virtual Environment

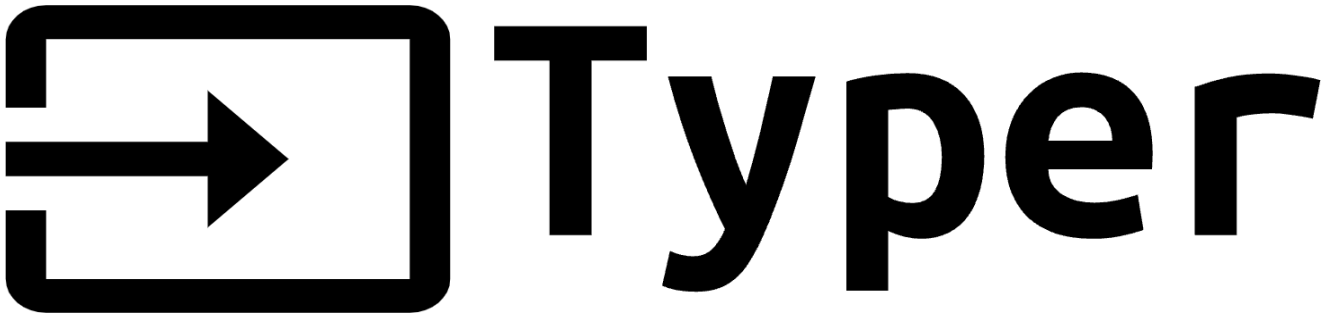
*Poetry is **a tool for dependency management and packaging** in Python. It allows you to declare the libraries your project depends on, and it will manage (install/update) them for you. Poetry offers a **lockfile** to ensure repeatable installs and can build your project for distribution.*

Python Resource - Poetry

https://python-poetry.org/

- Management support for Python and its resources
- Environments: manage dependencies in isolation
- Package: create a stand-alone executable application
- Publish: expedite and simplify the release of program to PyPI

Python Resource - Typer



https://typer.tiangolo.com/

- Command line interface support for program inputs and parameters
- Annotations: assigns types to functions that accept arguments (parameters)
- Productivity: types aid in the creation of the interface
- Checking: Confirm that inputs match expected types.

A Hello User Program

- Decide on the purpose and composition of the project
  - Our project: Say hello to the user
  - Parameters firstName, middleName and lastName as parameters
  - No output, other than screen printing
  - Execution: Program greets user by full name
  - One function in project: main()

Setup Steps

- Make a working directory

```
mkdir project2
cd project2
```

- Use Poetry to create new project

```
poetry new hello_user
cd hello_user
```

- Add Project Dependencies

```
poetry add typer
poetry add rich
```

- Add Project Development Dependencies

```
poetry add -D black mypy
```

Mypy: http://mypy-lang.org/

Setup Steps

- Add File: project2/hello user/hello user/ init .py

```
"""Package-level docstring for hello_user package."""

__version__ = "0.1.0"
```

- Add File:projects/hello user/pyproject.toml

```
[project] ...

[tool.poetry.scripts]
hello_user = "hello_user.main:cli"

[tool.poetry.group.dev.dependencies] ...
```

- Update Poetry

```
poetry install
```

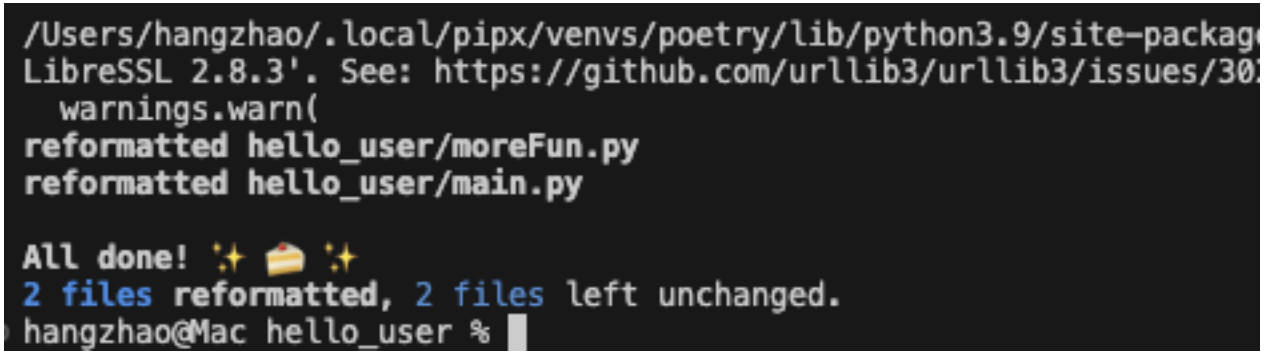
Add File: projects/hello user/hello user/main.py - File located in sanbox: main.py

```
#!/usr/bin/env python3
# -*- coding: utf-8 -*-
from rich.console import Console
import typer

# create a Typer object to support the command-line interface
cli = typer.Typer()
@cli.command()
def main(first: str = "", middle: str = "", last: str = ""):
                """Say hello to the person having a name of first, middle and last name"""
                console = Console()
                console.print(" Hello to;")
                console.print(f"\t First = {first}")
                console.print(f"\t Middle = {middle}")
                console.print(f"\t Last = {last}")
# end of main()
```

Basic Reformatting with Black

poetry run black hello_user tests



Execute Project

What do you see?

```
# run from projects/hello_user/hello_user
poetry run python3 hello_user/main.py --help
```

Execute Project

- What do you see?

```
# run from projects/hello_user
poetry run hello_user
```

- Without parameters

```
poetry run hello_user
Hello to;
        first =
        middle =
        last =
```

Execute Project

- What do you see?

```
# run from projects/hello_user poetry run hello_user

--first John

--middle H.

--last Davis
```

- Without parameters

```
Hello to;
        first = John
        middle = H.
        last = Davis
```