

# Discrete Structures: Setting Up Projects CMPSC 102

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Spring 2024  
Week 4  
Slides 01

# Let's Discuss

Discrete  
Structures:  
Setting Up  
Projects  
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Let's Discuss

Virtual  
Environments

Venv Project  
Setup  
Executing  
Black

Another  
Virtual  
Environment

New Poetry  
Project  
Test  
Execute Project

## Key Questions

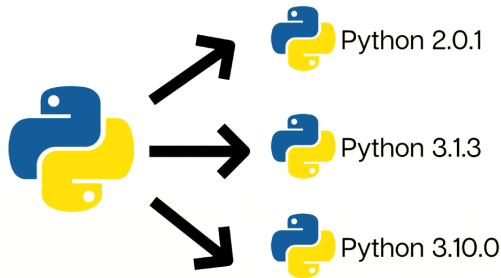
How do I use virtual environments like Venv, Poetry, Typer and other resources to create a professional project?

## Learning Objectives

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

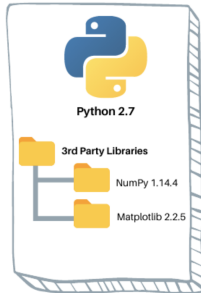
# Virtual Environments

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

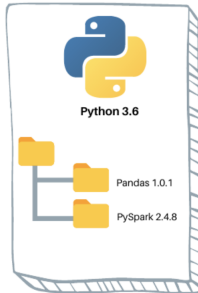


# Go Virtual

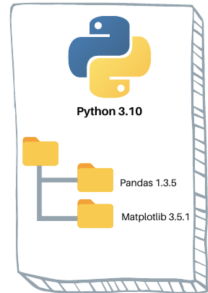
Virtual Environment 1



Virtual Environment 2



Virtual Environment 3



- 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

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- 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#supervised-learning](https://scikit-learn.org/stable/supervised_learning.html#supervised-learning)
  - 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

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## 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
```

## 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
```

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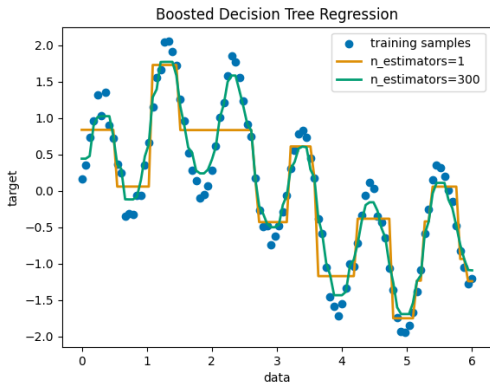
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# Black: a Python Script *formatter*

## 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](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](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 stirring birds 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

Umm, this type of Poetry ...

## Use a New Terminal

PYTHON PACKAGING AND DEPENDENCY MANAGEMENT MADE EASY

# Poetry

*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.*

<https://python-poetry.org/docs/>

PYTHON PACKAGING AND DEPENDENCY MANAGEMENT MADE EASY

# Poetry

<https://python-poetry.org/>

## Poetry

- 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

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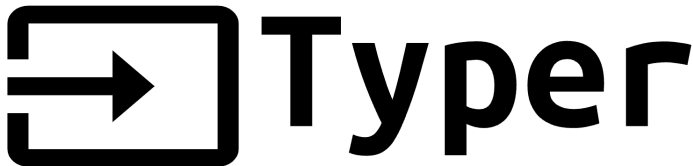
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<https://typer.tiangolo.com/>

### Typer

- 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

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- 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

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## Make a working directory

```
mkdir projects  
cd projects
```

## 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/>

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Add File: projects/hello\_user/hello\_user/\_\_init\_\_.py

```
"""Required docstring for an __init__ file."""
```

```
__version__ = "0.1.0"
```

Add File: projects/hello\_user/pyproject.toml

```
[tool.poetry] ...
```

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

```
[tool.poetry.dependencies] ...
```

Update Poetry

```
poetry install
```



# Add File: projects/hello\_user/hello\_user/main.py

File located in sandbox: main.py

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```
#!/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"first = {first}")
    console.print(f"middle = {middle}")
    console.print(f"last = {last}")
# end of main()
```

# Basic Reformatting with Black

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```
poetry run black hello_user tests
```

```
obonhamcarter@MacBookPro-2017 hello_user % poetry run black hello_user tests
reformatted hello_user/main.py
```

```
All done! ✨ 🍰 ✨
```

```
1 file reformatted, 2 files left unchanged.
```

# Execute Project

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## What do you see?

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

```
obonhamcarter@MacBookPro-2017 hello_user % poetry run hello_user --help
```

```
Usage: hello_user [OPTIONS]
```

```
Say hello to the person having a name of first, middle and last name
```

```
Options
```

```
--first TEXT
```

```
--middle TEXT
```

```
--last TEXT
```

```
--install-completion [bash|zsh|fish|powershell  
pwsh]
```

Install completion for  
the specified shell.  
[default: None]

```
--show-completion [bash|zsh|fish|powershell  
pwsh]
```

Show completion for the  
specified shell, to copy  
it or customize the  
installation.  
[default: None]

```
--help
```

Show this message and  
exit.

# Execute Project

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## 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

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## What do you see?

```
# run from projects/hello_user
poetry run hello_user
    --first Darth
    --middle Cornelius
    --last Vader
```

## With parameters

```
Hello to;
    first = Darth
    middle = Cornelius
    last = Vader
```

# Darth *Cornelius* Vader

## Add a Field For Best Holiday Spot?

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