Adnan Dawood

May 21, 2024

Foundations of Programming: Python

Assignment 06

Functions

Introduction:

In Python programming, efficiency, readability, and maintainability are paramount. As scripts evolve from small-scale prototypes to complex applications, employing advanced techniques becomes essential for ensuring robustness and scalability. Among these techniques, leveraging functions, classes, and the separation of concerns programming pattern stand out as fundamental strategies for enhancing script quality and developer productivity.

In this assignment, we'll delve into three common techniques for improving Python scripts: functions, classes, and the separation of concerns programming pattern. Each of these techniques plays a distinct role in streamlining code structure, promoting reusability, and fostering code maintainability. By mastering these concepts, Python developers can unlock the full potential of their scripts, enabling them to tackle larger projects with confidence and efficiency.

Drafting the Code:

This Python program defines a CourseRegistration class that simulates a course registration system. It allows to register students for a course, display current data, save data to a file, and exit the program.

Code (script) breakdown:

Libraries Imported:

import json: Imports the JSON module, which is used for handling JSON data.

Class Definitions:

1- FileProcessor:

This class is responsible for handling file processing operations.

It contains two static methods:

- **read_data_from_file(file_name: str, student_data: list)**: Reads data from a JSON file and loads it into a list.

- **write_data_to_file(file_name: str, student_data: list)**: Writes data from a list to a JSON file.

2- IO:

- This class handles input/output operations.
- It includes static methods for displaying menus, taking user inputs, displaying error messages, displaying student data, and inputting student data.

Method Documentation:

Each method in both classes includes detailed documentation describing its purpose, parameters, and return values.

Constants and Variables:

- **MENU:** A string constant representing the menu options for the course registration program.
- **FILE_NAME:** A string constant representing the name of the file used for storing enrollment data.
- **student_data:** A list variable used for storing student enrollment data.

Main Program Logic:

- The program starts by reading data from the JSON file specified by FILE_NAME using FileProcessor.read_data_from_file() method.
- It then enters an infinite loop where it displays the menu using IO.output_menu() method and prompts the user for input using IO.input_menu_choice() method.
- Based on the user's input, the program performs various actions:
  1- If the user chooses option 1, it calls IO.input_student_data() method to input student data.
  2- If the user chooses option 2, it calls IO.output_student_courses() method to display current student data.
  3- If the user chooses option 3, it writes the current student data to the file using FileProcessor.write_data_to_file() method and then displays the data again.
  4- If the user chooses option 4, it breaks out of the loop and ends the program.
- If the user enters an invalid option, it displays an error message prompting the user to choose a valid option.

Program Execution:

- The program continuously loops until the user chooses to exit by selecting option 4.
- After the loop ends, it displays "Program Ended".

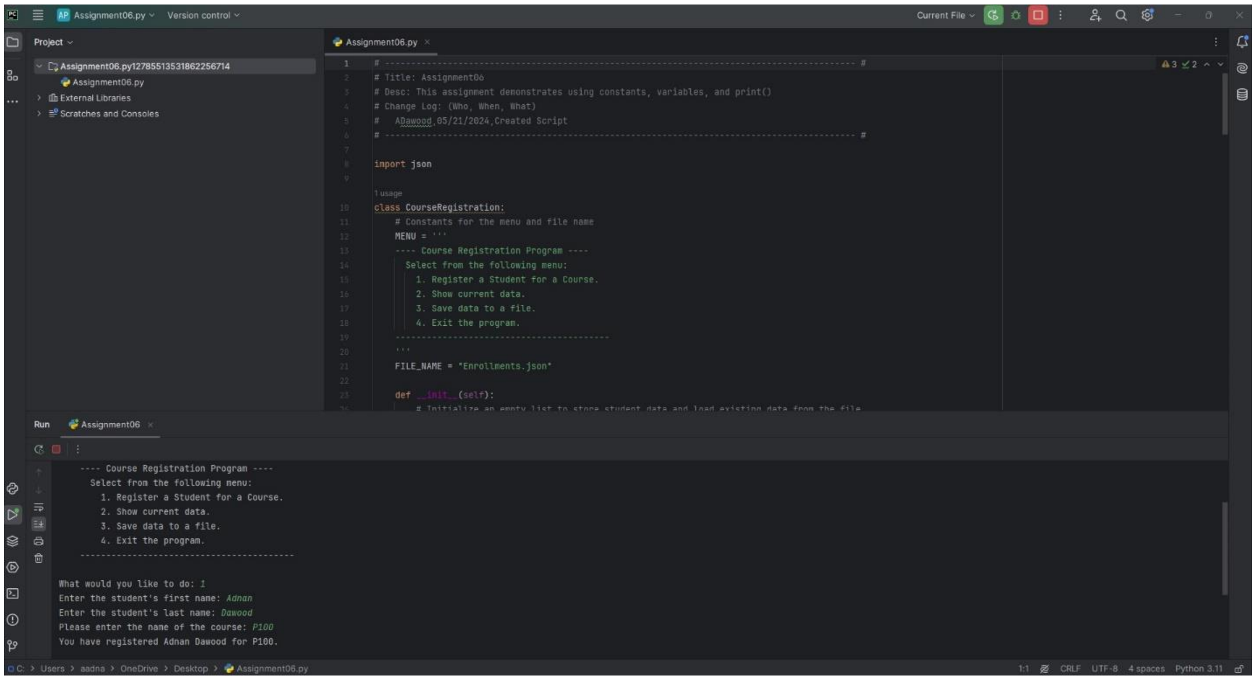
This breakdown covers explaining the program structure, functionality, and execution flow.

Testing the script and the findings:

I used PyCharm to evaluate my script. Also, the script was evaluated in terminal.

1. **Here is how my script looks like and its output in PyCharm:**

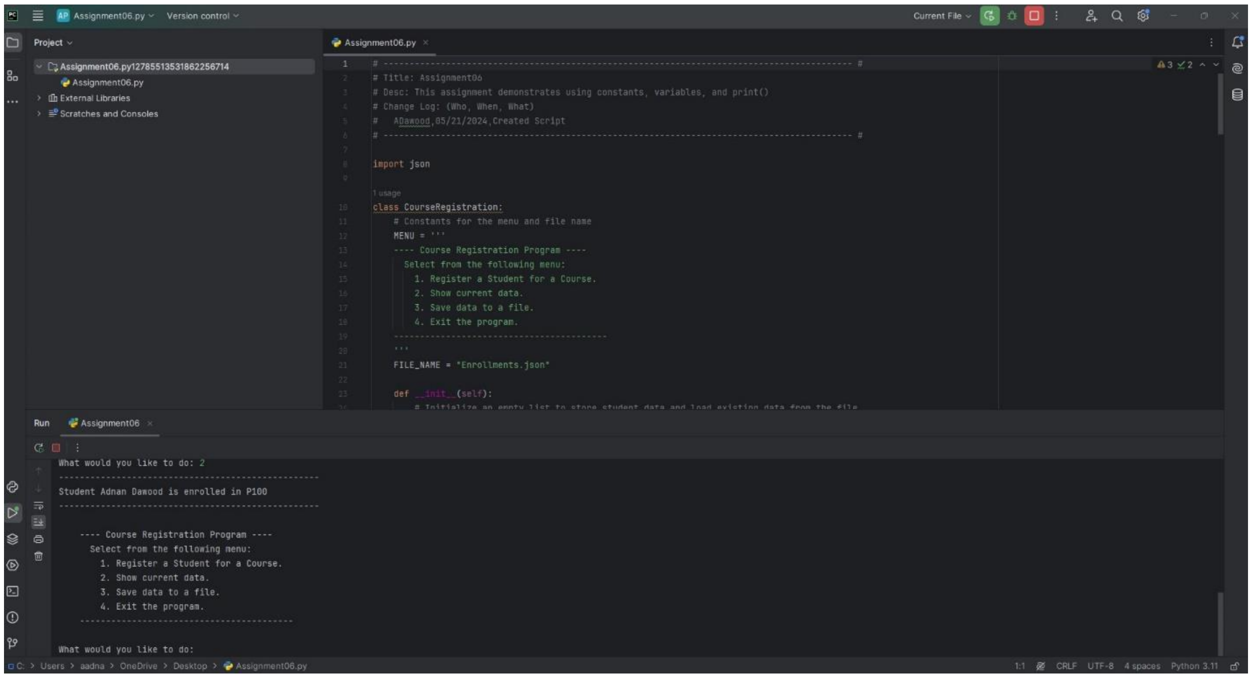
a- Running the program and entering 1 for option one “Register a Student for a Course” as shown in the picture below:



```python
# ------------------------------------------------------------------------------------------ #
# Title: Assignment06
# Desc: This assignment demonstrates using constants, variables, and print()
# Change Log: (Who, When, What)
#   ADawood,05/21/2024,Created Script
# ------------------------------------------------------------------------------------------ #

import json

class CourseRegistration:
    # Constants for the menu and file name
    MENU = '''
    ---- Course Registration Program ----
      Select from the following menu:
        1. Register a Student for a Course.
        2. Show current data.
        3. Save data to a file.
        4. Exit the program.
    -----------------------------------------
    '''
    FILE_NAME = "Enrollments.json"

    def __init__(self):
        # Initialize an empty list to store student data and load existing data from the file
```

```
    ---- Course Registration Program ----
      Select from the following menu:
        1. Register a Student for a Course.
        2. Show current data.
        3. Save data to a file.
        4. Exit the program.
    -----------------------------------------

What would you like to do: 1
Enter the student's first name: Adnan
Enter the student's last name: Dawood
Please enter the name of the course: P100
You have registered Adnan Dawood for P100.
```

b- Entering 2 for option two “Show current data” as shown in the picture below:



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        3. Save data to a file.
        4. Exit the program.
    -----------------------------------------
    '''
    FILE_NAME = "Enrollments.json"

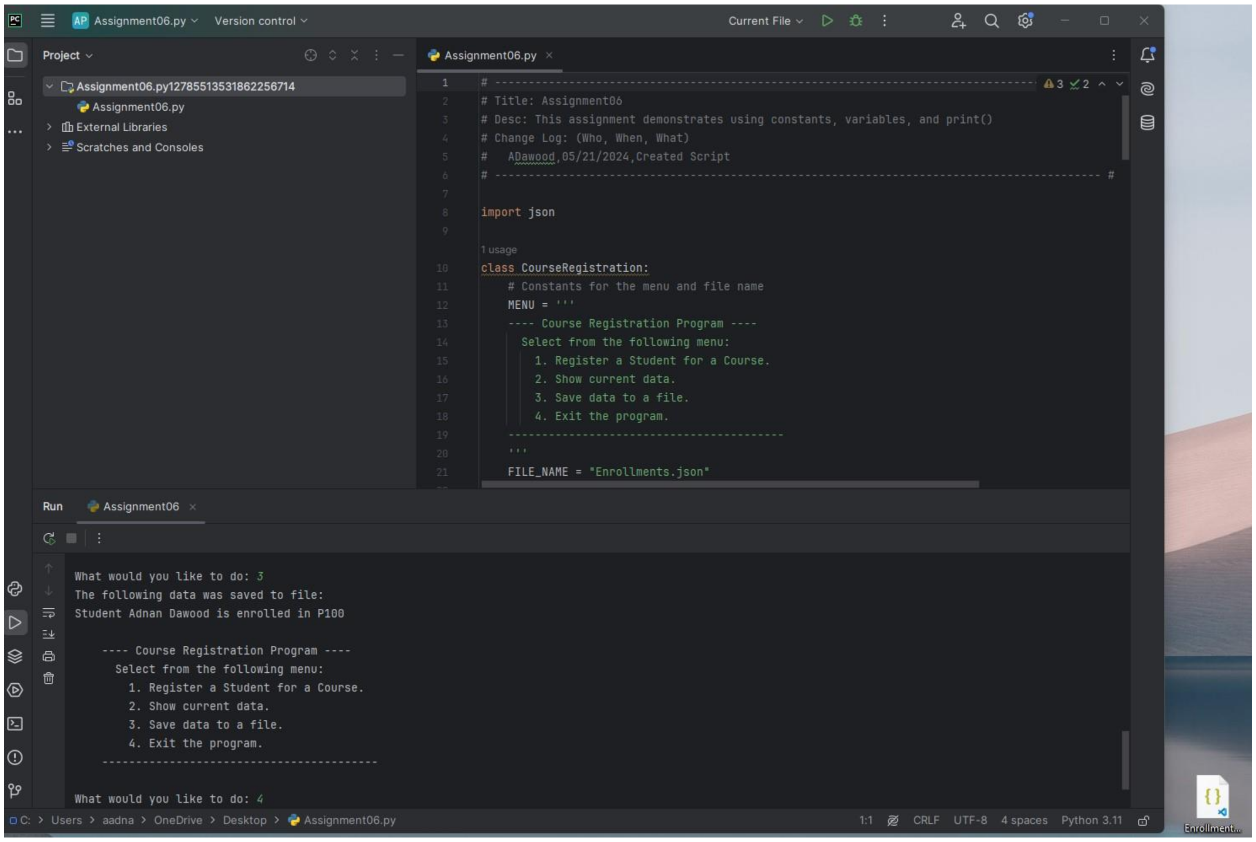
    def __init__(self):
        # Initialize an empty list to store student data and load existing data from the file
```

```
What would you like to do: 2
--------------------------------------------------
Student Adnan Dawood is enrolled in P100
--------------------------------------------------

    ---- Course Registration Program ----
      Select from the following menu:
        1. Register a Student for a Course.
        2. Show current data.
        3. Save data to a file.
        4. Exit the program.
    -----------------------------------------

What would you like to do:
```

c- Entering 3 for option three “Save data to a file (check the right side of the picture)” as shown in the picture below:



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# ------------------------------------------------------------------------------------------ #
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    ---- Course Registration Program ----
      Select from the following menu:
        1. Register a Student for a Course.
        2. Show current data.
        3. Save data to a file.
        4. Exit the program.
    -----------------------------------------
    '''
    FILE_NAME = "Enrollments.json"
```
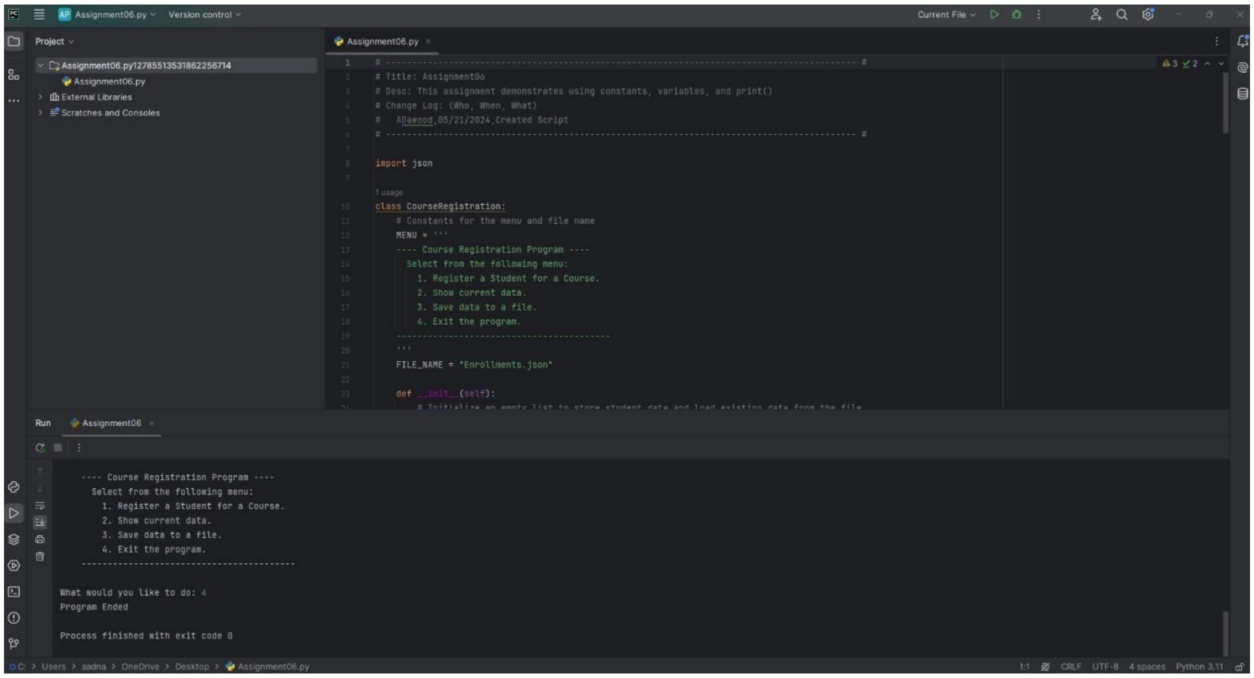

```
What would you like to do: 3
The following data was saved to file:
Student Adnan Dawood is enrolled in P100

    ---- Course Registration Program ----
      Select from the following menu:
        1. Register a Student for a Course.
        2. Show current data.
        3. Save data to a file.
        4. Exit the program.
    -----------------------------------------

What would you like to do: 4
```

d- Entering 4 for option four “Exit the program” as shown in the picture below:



```
# ------------------------------------------------------------------------------------------ #
# Title: Assignment06
# Desc: This assignment demonstrates using constants, variables, and print()
# Change Log: (Who, When, What)
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# ------------------------------------------------------------------------------------------ #

import json

class CourseRegistration:
    # Constants for the menu and file name
    MENU = '''
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    -----------------------------------------
    '''
    FILE_NAME = "Enrollments.json"

    def __init__(self):
```
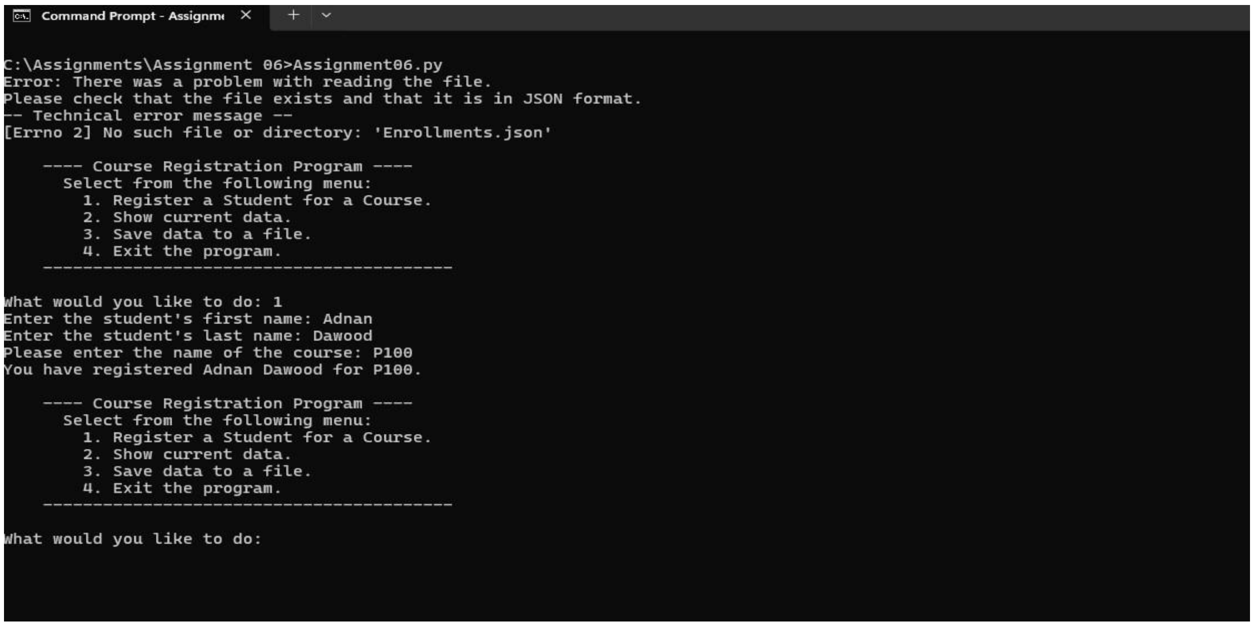

```
    ---- Course Registration Program ----
      Select from the following menu:
        1. Register a Student for a Course.
        2. Show current data.
        3. Save data to a file.
        4. Exit the program.
    -----------------------------------------

What would you like to do: 4
Program Ended

Process finished with exit code 0
```

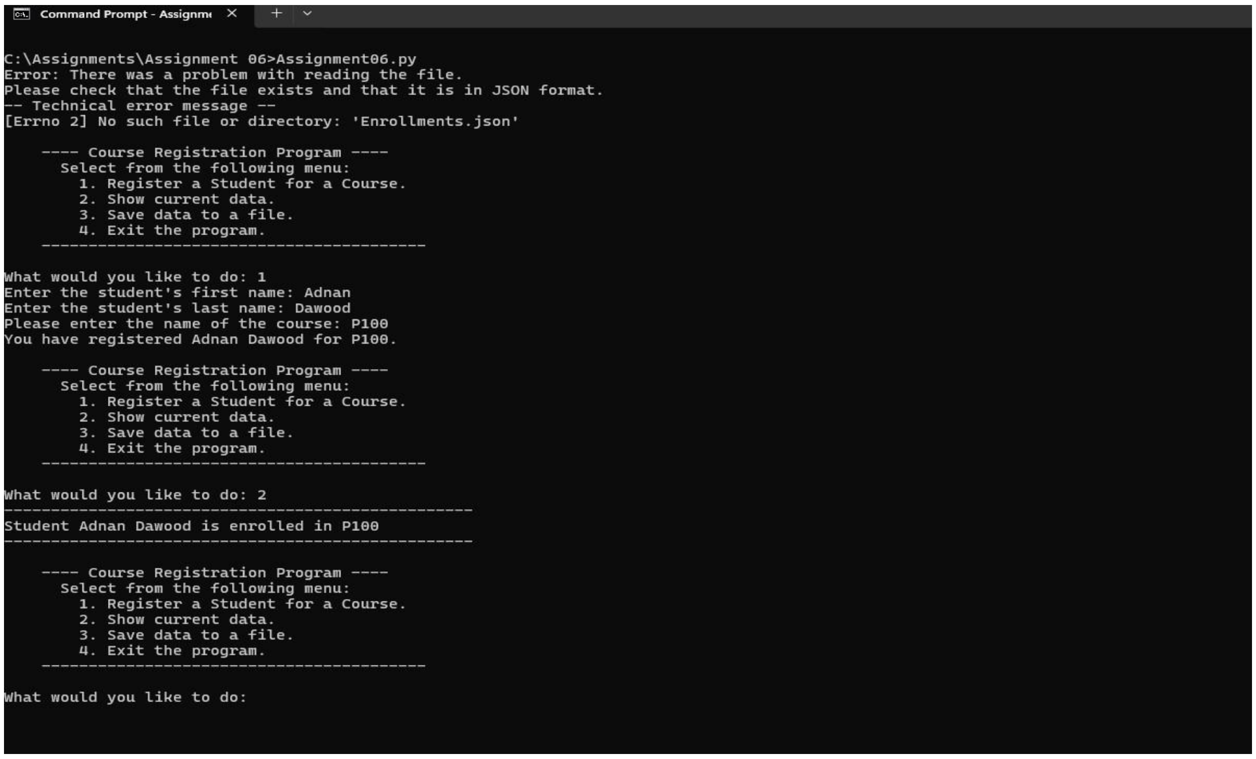
2- Here is how my script looks like and its output in terminal:

a- Running the program in terminal and entering 1 for option one “Register a Student for a Course” as shown in the picture below:



```
C:\Assignments\Assignment 06>Assignment06.py
Error: There was a problem with reading the file.
Please check that the file exists and that it is in JSON format.
-- Technical error message --
[Errno 2] No such file or directory: 'Enrollments.json'

    ---- Course Registration Program ----
      Select from the following menu:
        1. Register a Student for a Course.
        2. Show current data.
        3. Save data to a file.
        4. Exit the program.
    -----------------------------------------

What would you like to do: 1
Enter the student's first name: Adnan
Enter the student's last name: Dawood
Please enter the name of the course: P100
You have registered Adnan Dawood for P100.

    ---- Course Registration Program ----
      Select from the following menu:
        1. Register a Student for a Course.
        2. Show current data.
        3. Save data to a file.
        4. Exit the program.
    -----------------------------------------

What would you like to do:
```

b- Entering 2 for option two “Show current data” as shown in the picture below:



```
C:\Assignments\Assignment 06>Assignment06.py
Error: There was a problem with reading the file.
Please check that the file exists and that it is in JSON format.
-- Technical error message --
[Errno 2] No such file or directory: 'Enrollments.json'

    ---- Course Registration Program ----
      Select from the following menu:
        1. Register a Student for a Course.
        2. Show current data.
        3. Save data to a file.
        4. Exit the program.
    -----------------------------------------

What would you like to do: 1
Enter the student's first name: Adnan
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Please enter the name of the course: P100
You have registered Adnan Dawood for P100.

    ---- Course Registration Program ----
      Select from the following menu:
        1. Register a Student for a Course.
        2. Show current data.
        3. Save data to a file.
        4. Exit the program.
    -----------------------------------------

What would you like to do: 2
--------------------------------------------------
Student Adnan Dawood is enrolled in P100
--------------------------------------------------

    ---- Course Registration Program ----
      Select from the following menu:
        1. Register a Student for a Course.
        2. Show current data.
        3. Save data to a file.
        4. Exit the program.
    -----------------------------------------

What would you like to do:
```
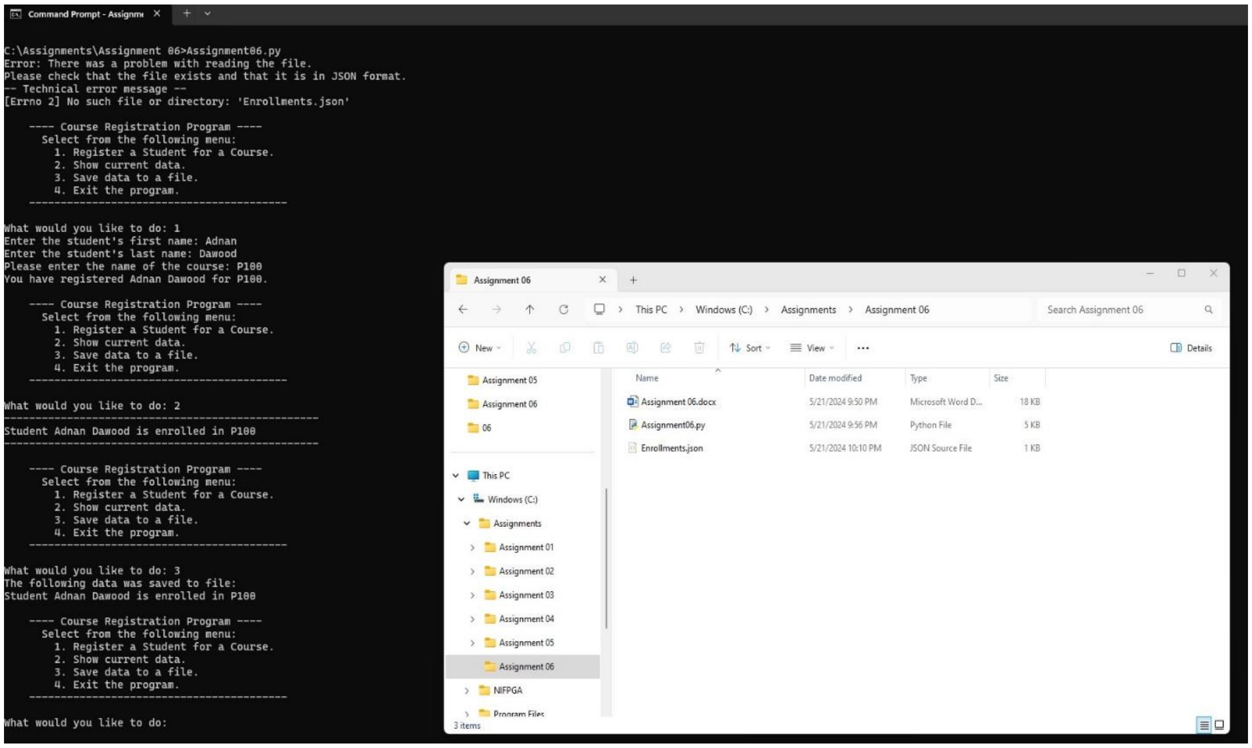

c- Entering 3 for option three “Save data to a file (check the right side of the picture)” as shown in the picture below:



```
C:\Assignments\Assignment 06>Assignment06.py
Error: There was a problem with reading the file.
Please check that the file exists and that it is in JSON format.
-- Technical error message --
[Errno 2] No such file or directory: 'Enrollments.json'

    ---- Course Registration Program ----
      Select from the following menu:
        1. Register a Student for a Course.
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    ---- Course Registration Program ----
      Select from the following menu:
        1. Register a Student for a Course.
        2. Show current data.
        3. Save data to a file.
        4. Exit the program.
    -----------------------------------------

What would you like to do: 3
The following data was saved to file:
Student Adnan Dawood is enrolled in P100

    ---- Course Registration Program ----
      Select from the following menu:
        1. Register a Student for a Course.
        2. Show current data.
        3. Save data to a file.
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    -----------------------------------------

What would you like to do:
```
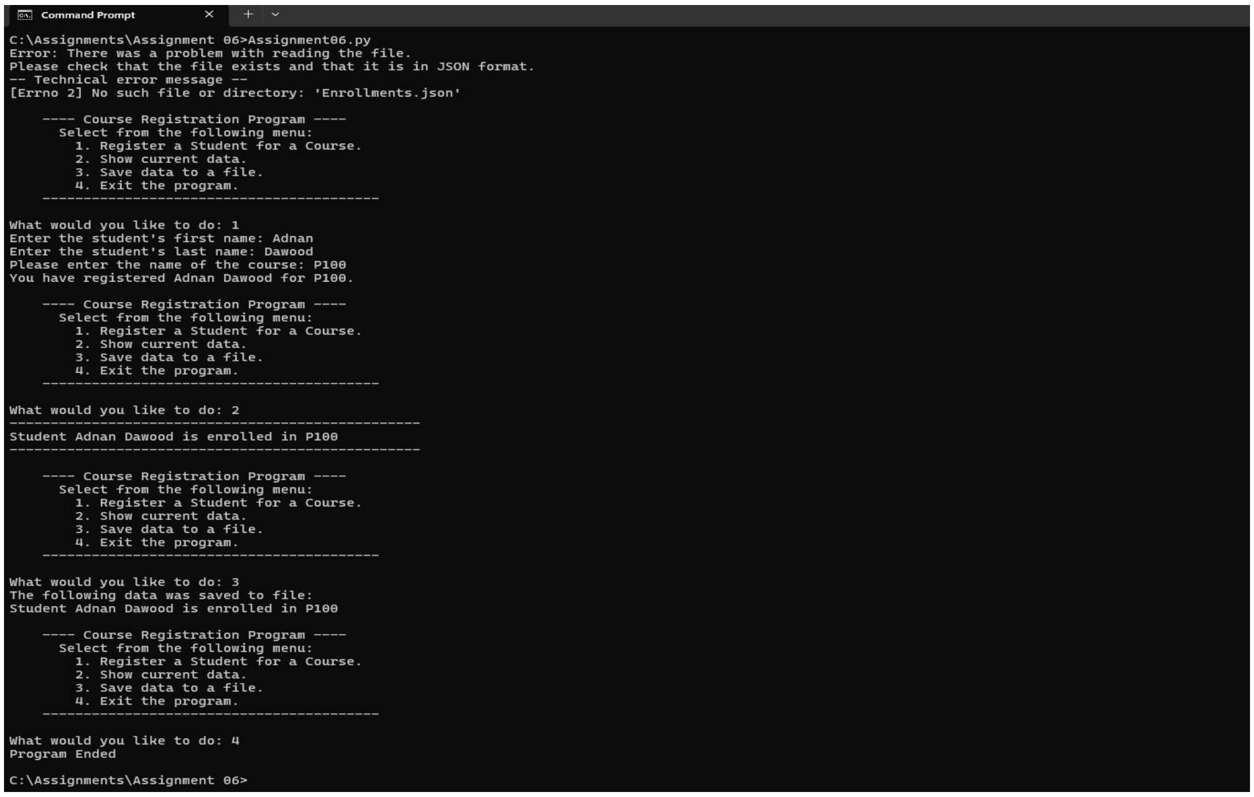

This PC > Windows (C:) > Assignments > Assignment 06

Name	Date modified	Type	Size
Assignment 06.docx	5/21/2024 9:50 PM	Microsoft Word D...	18 KB
Assignment06.py	5/21/2024 9:56 PM	Python File	5 KB
Enrollments.json	5/21/2024 10:10 PM	JSON Source File	1 KB

3 items

d- Entering 4 for option four “Exit the program” as shown in the picture below:



```
C:\Assignments\Assignment 06>Assignment06.py
Error: There was a problem with reading the file.
Please check that the file exists and that it is in JSON format.
-- Technical error message --
[Errno 2] No such file or directory: 'Enrollments.json'

    ---- Course Registration Program ----
      Select from the following menu:
        1. Register a Student for a Course.
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    ---- Course Registration Program ----
      Select from the following menu:
        1. Register a Student for a Course.
        2. Show current data.
        3. Save data to a file.
        4. Exit the program.
    -----------------------------------------

What would you like to do: 4
Program Ended

C:\Assignments\Assignment 06>
```

Summary:

Improving Python scripts often involves employing advanced techniques like functions, classes, and the separation of concerns programming patterns. Functions allow for modularizing code by encapsulating specific tasks, promoting code reuse and readability. Classes provide a blueprint for creating objects with attributes and methods, enabling the organization of related functionality into cohesive units. Additionally, the separation of concerns programming pattern emphasizes dividing code into distinct modules, each responsible for a specific aspect of functionality, leading to clearer code structure and easier maintenance. By mastering these techniques, Python developers can enhance script quality, scalability, and maintainability, ultimately empowering them to tackle complex projects with efficiency and confidence.