

Christina Alvarez  
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Foundations of Programming (Python)  
Assignment 5

## **Assignment 05: Advance Collections and Error Handling**

### **Introduction**

In this document I will cover the completion of assignment five for Foundations of Programming – Python. For this assignment we learn more about collections of data, introduce the concept of dictionaries and explore additional file types. This document will cover the following topics:

- Terms to know
- Steps taken for assignment 5
- Summary of learnings

### **Terms to Know**

Dictionaries: for Python this term refers to the storing of data values and their keys.

JSON (JavaScript Option Notation): is a flexible and hierarchical format best for the representation of structured data with varying complexity. (Introduction of Programing with Python – Module05 Notes)

CSV (Comma Separated Values): a tabular format used for import/export, data collection, and analysis, ideal for larger sets of data. (Introduction of Programing with Python – Module05 Notes)

### **Steps Taken for Assignment 5**

For assignment five we were provided with starter code. I opened the starter code in PyCharm and updated the starter code header to reflect the work I would be completing. See figure 1.

```
Assignment05.py x
1 # -----
2 # Title: Assignment05
3 # Desc: This assignment demonstrates using dictionaries, files, and
4 # Change Log: (Who, When, What)
5 #   CAlvarez,11/13/2024, Created Script
6 # -----
7
8 # Define the Data Constants
9 MENU: str = ''
10 ---- Course Registration Program ----
11   Select from the following menu:
12   1. Register a Student for a Course.
13   2. Show current data.
14   3. Save data to a file.
15   4. Exit the program.
16 -----
17 '''
18 # Define the Data Constants
19 FILE_NAME: str = "Enrollments.csv"
20
21 # Define the Data Variables and constants
22 student_first_name: str = '' # Holds the first name of a student
23 student_last_name: str = '' # Holds the last name of a student
24 course_name: str = '' # Holds the name of a course entered by the
25 student_data: list = [] # one row of student data
26 students: list = [] # a table of student data
27 csv_data: str = '' # Holds combined string data separated by a comma
28 file = None # Holds a reference to an opened file.
29 menu_choice: str # Hold the choice made by the user.
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```

I reviewed the code to make updates to support assignment five. The part of the script that reads the file was updated to reflect the usage of dictionaries instead of lists. The transformation of the data from the file was added depicting how the rows of the file should be stripped and split. For the student data dictionary the keys and values were defined. For the constants and variables section parts was added to be defined as a list. See figure 3 for updates made.

```
21 # Define the Data Variables and constants
22 student_first_name: str = '' # Holds the first name of a student entered by the user.
23 student_last_name: str = '' # Holds the last name of a student entered by the user.
24 course_name: str = '' # Holds the name of a course entered by the user.
25 student_data: dict[str,str] = {} # one row of student data - updated to a dictionary.
26 students: list = [] # a table of student data
27 csv_data: str = '' # Holds combined string data separated by a comma.
28 file:TextIO = None # Holds a reference to an opened file - changed to textIO for usability.
29 menu_choice: str # Hold the choice made by the user.
30 parts: list[str]
31
32 # When the program starts, read the file data into a list of lists (table)
33 # Extract the data from the file
34 file = open(FILE_NAME, "r")
35 for row in file.readlines():
36     # Transform the data from the file
37     parts = row.strip().split(',')
38     student_first_name = parts[0]
39     student_last_name = parts[1]
40     course_name = parts[2]
41     student_data = {'first_name':student_first_name,'last_name':student_last_name,'course_name':course_name}
42     # Load it into our collection (list of lists)
43     students.append(student_data)
44 file.close()
```

Figure 3. Updates to reading file

The first menu choice was updated to ensure dictionaries instead of lists were being used. As part of this step I needed to ensure the keys and variables were kept consistent with what was defined in the read file section of the script. Figure 4 below shows the update to student data.

```
53 # Input user data
54 if menu_choice == "1": # This will not work if it is an integer!
55     student_first_name = input("Enter the student's first name: ")
56     student_last_name = input("Enter the student's last name: ")
57     course_name = input("Please enter the name of the course: ")
58     student_data = {'first_name':student_first_name,'last_name':student_last_name,'course_name':course_name}
59     students.append(student_data)
60     print(f"You have registered {student_first_name} {student_last_name} for {course_name}.")
61     continue
62
```

Figure 4. Menu choice one updates

Menu choice two was updated to depict the updated keys. See figure 5.

```

63 # Present the current data
64 elif menu_choice == "2":
65
66     # Process the data to create and display a custom message
67     print("-"*50)
68     for student in students:
69         print(f"Student {student['first_name']} {student['last_name']} is enrolled in {student['course_name']}")
70     print("-"*50)
71     continue

```

Figure 5. Menu choice two updates

The third menu choice then had updates made to reflect the keys. See figure 6.

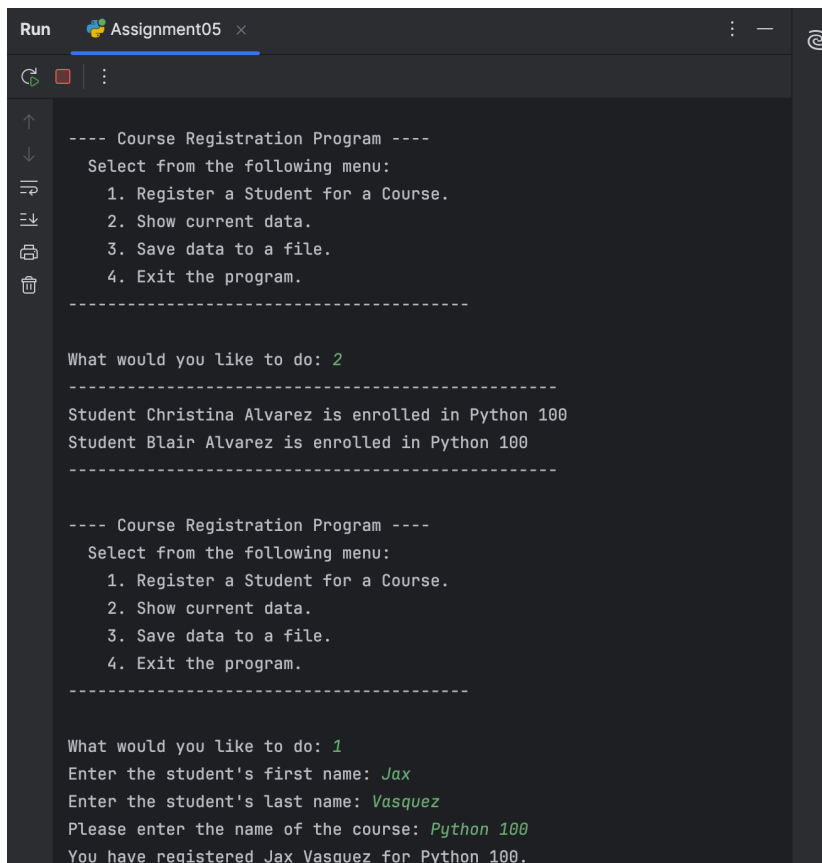
```

73 # Save the data to a file
74 elif menu_choice == "3":
75     file = open(FILE_NAME, "w")
76     for student in students:
77         csv_data = f"{student['first_name']},{student['last_name']},{student['course_name']}\n"
78         file.write(csv_data)
79     file.close()
80     print("The following data was saved to file!")
81     for student in students:
82         print(f"Student {student['first_name']} {student['last_name']} is enrolled in {student['course_name']}")
83     continue

```

Figure 6. Menu choice 3 updates

I ran the code to confirm all was working as expected.



```

Run Assignment05 x
---- 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 Christina Alvarez is enrolled in Python 100
Student Blair Alvarez is enrolled in Python 100
-----

---- 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: Jax
Enter the student's last name: Vasquez
Please enter the name of the course: Python 100
You have registered Jax Vasquez for Python 100.

```

Figure 7. Run of code

Once confirmed that the code would run I looked for areas for exceptions. While working on the code I ran into the error of not finding the file or this program so I decided to added an exception and an error message in the event a user runs into this issue. Figure 8 depicts the update to the code for this error handling.

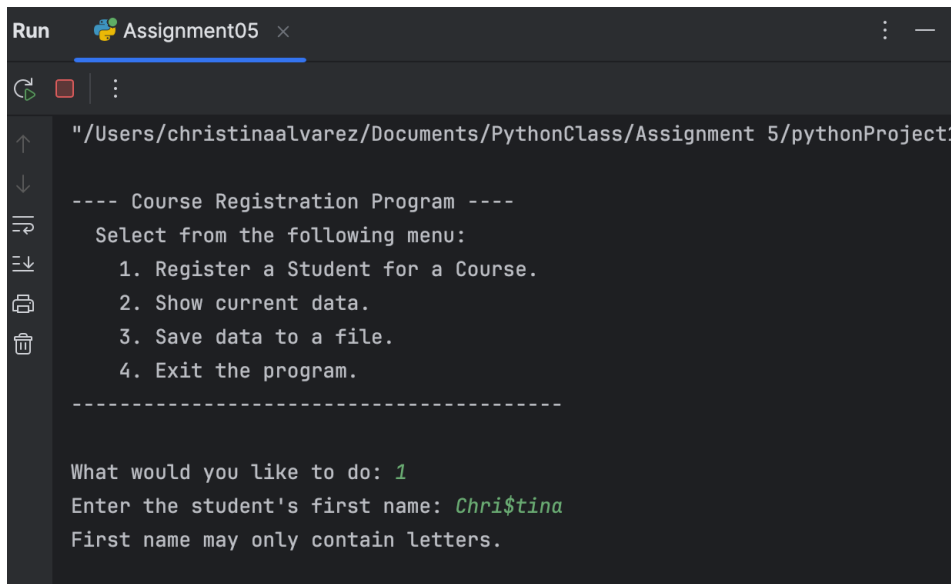
```
33 # When the program starts, read the file data into a list of lists (table)
34 # Extract the data from the file
35 try:
36     file = open(FILE_NAME, "r")
37     for row in file.readlines():
38         # Transform the data from the file
39         parts = row.strip().split(',')
40         student_first_name = parts[0]
41         student_last_name = parts[1]
42         course_name = parts[2]
43         student_data = {'first_name':student_first_name,'last_name':student_last_name,'course_name':course_name}
44         # Load it into our collection (list of lists)
45         students.append(student_data)
46     file.close()
47 except FileNotFoundError:
48     print('File not found. File being created.')
49     open(FILE_NAME, 'w')
50 except Exception as e:
51     print('Unknown exception', type(e), e)
52 finally:
53     if file and not file.closed:
54         file.close()
```

Figure 8. Exception for file not found and error handling

Additional error handling and notification was added for user inputs for student's first name and last name. The figure below shows the error handling for these entries in figure 9 and figure 10 shows an example if a user did not use letters for the first name.

```
63 # Input user data
64 if menu_choice == "1": # This will not work if it is an integer!
65     try:
66         student_first_name = input("Enter the student's first name: ")
67         if not student_first_name.isalpha():
68             raise ValueError('First name may only contain letters.')
69         student_last_name = input("Enter the student's last name: ")
70         if not student_last_name.isalpha():
71             raise ValueError('Last name may only contain letters.')
72         course_name = input("Please enter the name of the course: ")
73         student_data = {'first_name':student_first_name,'last_name':student_last_name,'course_name':course_name}
74         students.append(student_data)
75         print(f'You have registered {student_first_name} {student_last_name} for {course_name}.')
76     except ValueError as e:
77         print(e)
```

Figure 9. Errors created for menu choice 1



```
Run Assignment05 x
"/Users/christinaalvarez/Documents/PythonClass/Assignment 5/pythonProject

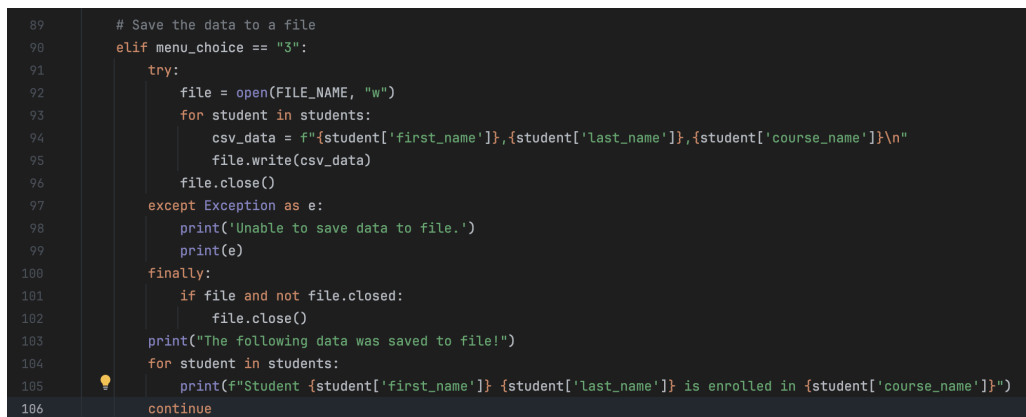
---- Course Registration Program ----
Select from the following menu:
    1. Register a Student for a Course.
    2. Show current data.
    3. Save data to a file.
    4. Exit the program.

-----

What would you like to do: 1
Enter the student's first name: Chri$tina
First name may only contain letters.
```

Figure 10. Error message for not letter input

Additional error handling was added to ensure files can be written and saved as part of menu choice three if the new data cannot be added.



```
89 # Save the data to a file
90 elif menu_choice == "3":
91     try:
92         file = open(FILE_NAME, "w")
93         for student in students:
94             csv_data = f"{student['first_name']},{student['last_name']},{student['course_name']}\n"
95             file.write(csv_data)
96         file.close()
97     except Exception as e:
98         print('Unable to save data to file.')
99         print(e)
100     finally:
101         if file and not file.closed:
102             file.close()
103     print("The following data was saved to file!")
104     for student in students:
105         print(f"Student {student['first_name']} {student['last_name']} is enrolled in {student['course_name']}")
106     continue
```

Figure 11. Error for unable to add date to file

Lastly, I change the data type from a csv to a JSON. The JSON module was added to the script (figure 12) and areas where csv was referred to was updated to JSON.

```
Assignment05.py x
2 # Title: Assignment05
3 # Desc: This assignment demonstrates using dictionaries, files, and exception handling
4 # Change Log: (Who, When, What)
5 #   CALvarez,11/13/2024, Created Script
6 # ----- #
7 from typing import TextIO
8
9 import json # import code from Python's json module into this script
10
11 # Define the Data Constants
12 MENU: str = '''
13 ---- Course Registration Program ----
14   Select from the following menu:
15   1. Register a Student for a Course.
16   2. Show current data.
17   3. Save data to a file.
18   4. Exit the program.
19 -----
20 '''
21 # Define the Data Constants
22 FILE_NAME: str = "Enrollments.json"
23
24 # Define the Data Variables and constants
25 student_first_name: str = '' # Holds the first name of a student entered by the user.
26 student_last_name: str = '' # Holds the last name of a student entered by the user.
27 course_name: str = '' # Holds the name of a course entered by the user.
28 student_data: dict[str,str] = {} # one row of student data - updated to a dictionary.
29 students: list = [] # a table of student data
30 json_data: str = '' # Holds combined string data separated by a comma.
31 file: TextIO = None # Holds a reference to an opened file - changed to textIO for usability.
32 menu_choice: str # Hold the choice made by the user.
33 parts: list[str]
```

Figure 12. JSON module imported and data variable updated

## Summary of learnings

Lists and dictionaries have many similarities however the biggest difference from a coding perspective is how individual values are accessed and the keys that are defined for dictionaries. I also saw the value in the different types of file storage such as CSV and JSON that were used in this project. CSV is ideal for data that is tabular and would be considered flat. Whereas JSON is better suited for more complex data sets that are nested and object oriented.