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Foundations of Programming (Python)

Assignment06

https://github.com/KCClarke/ITFnd100-Mod6

Organization in Python

Introduction

This assignment shows the use of functions and classes in a Python script to explain the separation of concerns in computer programming. Functions and classes are tools for a programmer to use to make computer code organized to read, and adaptable for use in new situations. The separation of concerns allows for the main body of a program to read like a summary of a program.

Organization

Broadly, a program holds, processes and communicates data. The ways that a program deals with data are commonly known as concerns. It is useful to keep track of the different concerns by separating and grouping them together.

Without the use of classes and functions, separating concerns is difficult or awkward because the computer is taking commands line by line to accomplish a task in the real world according to the programmer. A computer may need to deal with data in any order of concern to accomplish a task but to be maximally readable and adaptable computer code is to be written with the separation of concerns in mind. Functions and classes allow for the writing of code to be organized by concern.

Functions

A function is a structure with a name that performs a task. A function is named by the programmer to give an idea of what the function does. A function may receive data via its parameters. A function may send data via its return statement.

When a function is defined it is loaded into the computer's memory. When a function is called, an argument may be sent to its parameters. A function only performs a task when it is called and may be called wherever it is needed after it is defined.

```
25      @staticmethod
26      def read_data_from_file(file_name, list_of_rows):
27          """ Reads data from a file into a list of dictionary rows
28
29          :param file_name: (string) with name of file:
30          :param list_of_rows: (list) you want filled with file data:
31          :return: (list) of dictionary rows
32          """
33          # TODO: Add Code Here!
34          list_of_rows.clear()  # clear current data
35          try:
36              file = open(file_name, "r")
37              for line in file:
38                  l_task, l_priority = line.split(",")
39                  row = {"Task": l_task.strip(), "Priority": l_priority.strip()}
40                  list_of_rows.append(row)
41              file.close()
42              return list_of_rows
43          except:
44              print("File not found.")
45
46          return list_of_rows
```

Figure 1. Defining a function named “read_data_from_a_file“ that has two parameters “file_name” and “list_of rows” (line 26). The function processes some data (lines 34 to 44) and returns the result (line 46).

Classes

A class is a structure with a name that organizes functions of similar purpose. A class is named by the programmer to give an idea of what the class is for. A class contains functions.

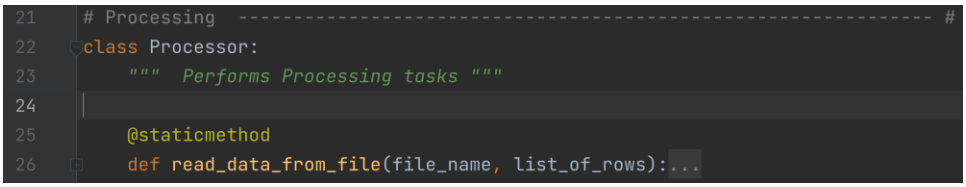

Figure 2. Defining a class named “Processor” (line 22) that contains a function (lines 25 & 26)

Scope

Variables named within a function or class are only available in the structure in which they are named and are said to be a local variable to that structure. Variables named outside of all functions and classes are said to be global. Global variables are available to all classes and functions after they are defined. Whether a variable is local or global refers to its scope.

First Concern

The first concern is naming what data is to be used throughout the program. Naming the data is a way to outline what a program is to do. Properly named variables, written at the top of a document will roughly outline the process of a program.

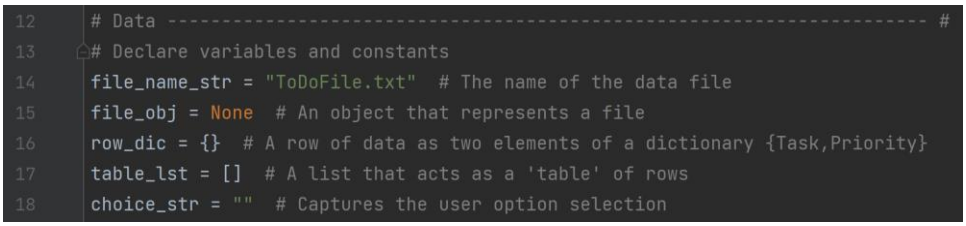

Figure 3. This program has a file (Line 14 & 15), uses a dictionary (Line 16), list (Line 17) named table, and has a string variable to capture different choices from the program user (Line 18).

Second Concern

The second concern is how the data of the program is to be processed. The ways in which data are processed can be captured in a class. A class contains functions and functions contain instructions on how to process data.

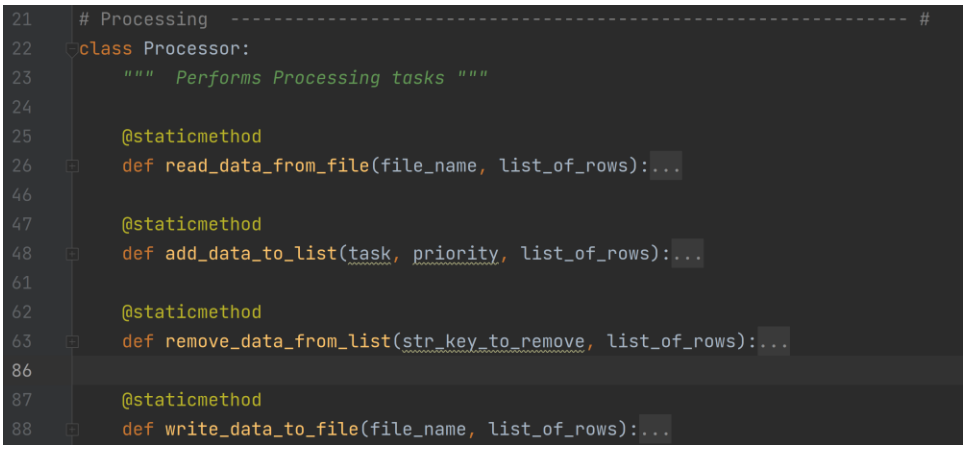

Figure 4. A class named “Processor” (line 22) contains functions to read, add, remove and write (lines 25 to 88) data.

Third Concern

The third concern is interaction with the program user. The ways in which the program interacts are also captured in a class. A class contains functions that contain instructions on how to interact with the program user.

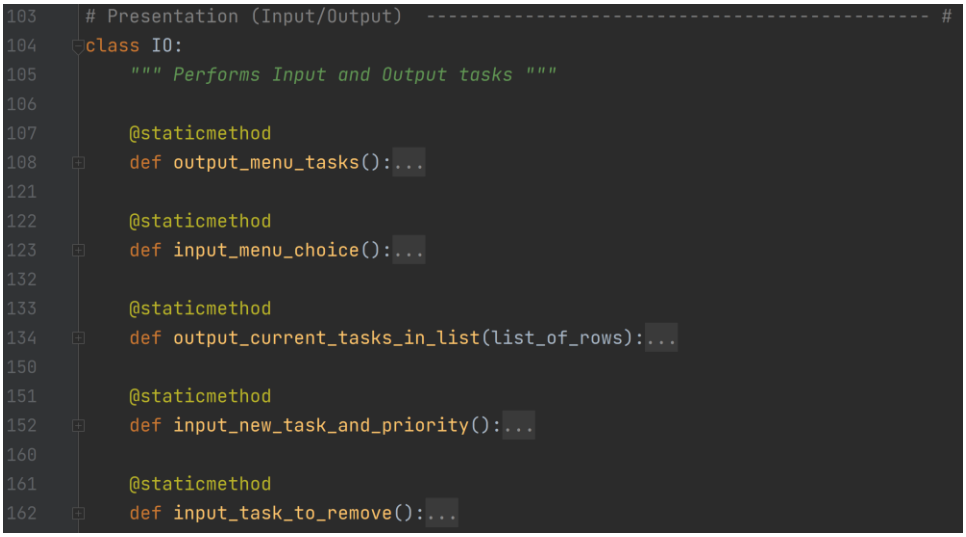

Figure 5. Defining a class named “IO” (line 104) contains functions that manage input and output to the program user (lines 107 to 162).

The Main Body

The “main body” of a program contains function calls and controls the flow of a program. This allows for a function to be used multiple times and in different ways according to the programmer, this makes the program flexible. Using classes and functions also allows for the main body of a script to read like a summary of what the program does. The main body of a program is usually at the bottom of a document.

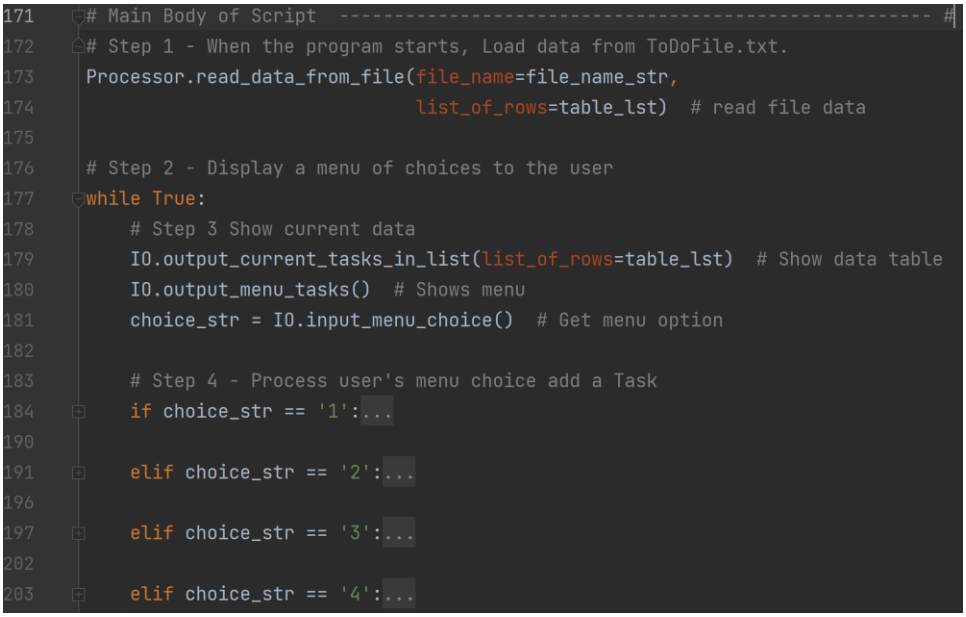

Figure 6. The main body of the script (lines 171 to 203) controls the flow of the program. Main calling classes to use functions to process data (line 173) and communicate with the user (lines 179 to 181).

Summary

Computer code may run correctly producing the intended results and be a nightmare to read. If a program is to be maintained overtime, it is good to first consider the separation of concerns. After the separation of concerns is accounted for break the code down into classes for each concern and then by functions for each class.

Other Assignment 6 Topics

Debugging in PyCharm

In PyCharm a programmer may want to run their code line by line to see how their program behaves.

Figure 7. Press this button or Shift+F9 on the keyboard to begin debugging a file.

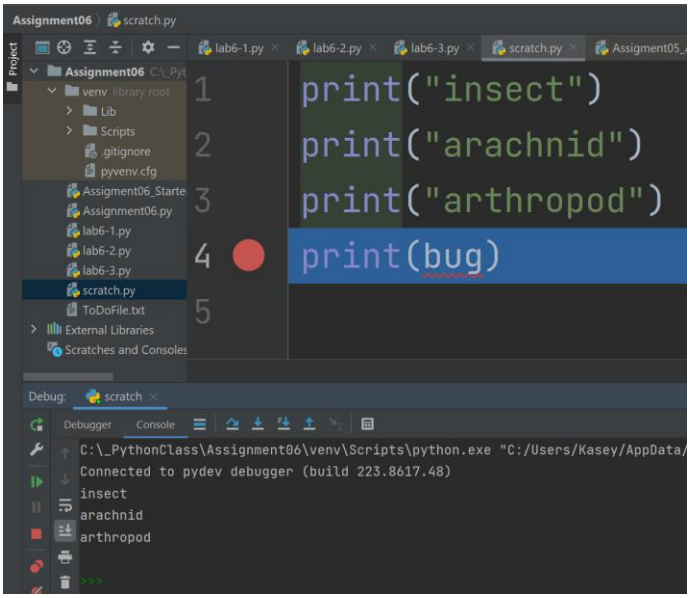

Figure 8. Printing three strings and stopping the run before the bug.

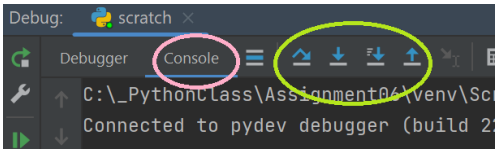

Figure 9. Under the console tab (pink circle) with the arrow buttons (green circle). The arrow buttons can be used to run individual lines of code.

GitHub Website

Git hub is a service offered to programmers to host and share projects with others.

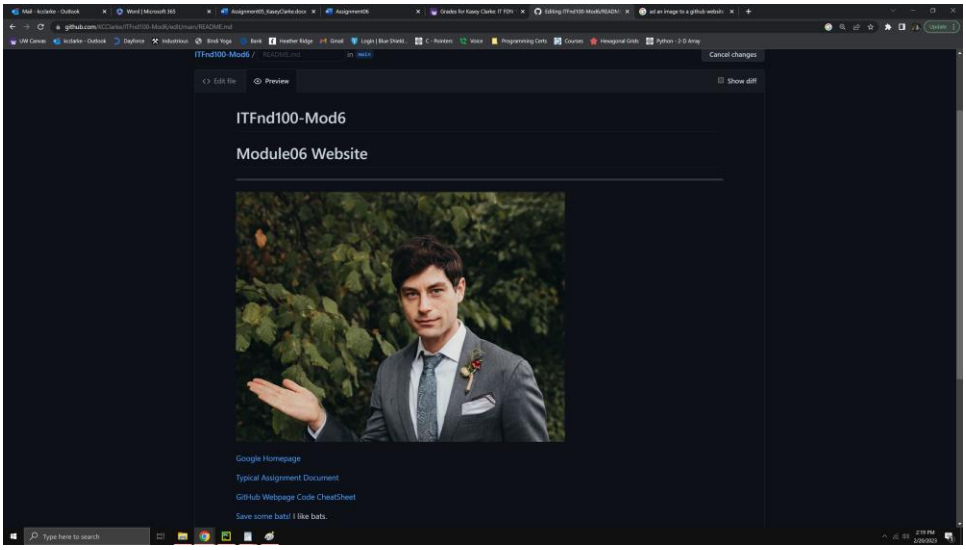

Figure 10. A GitHub website example.

Assignment 6 in PyCharm

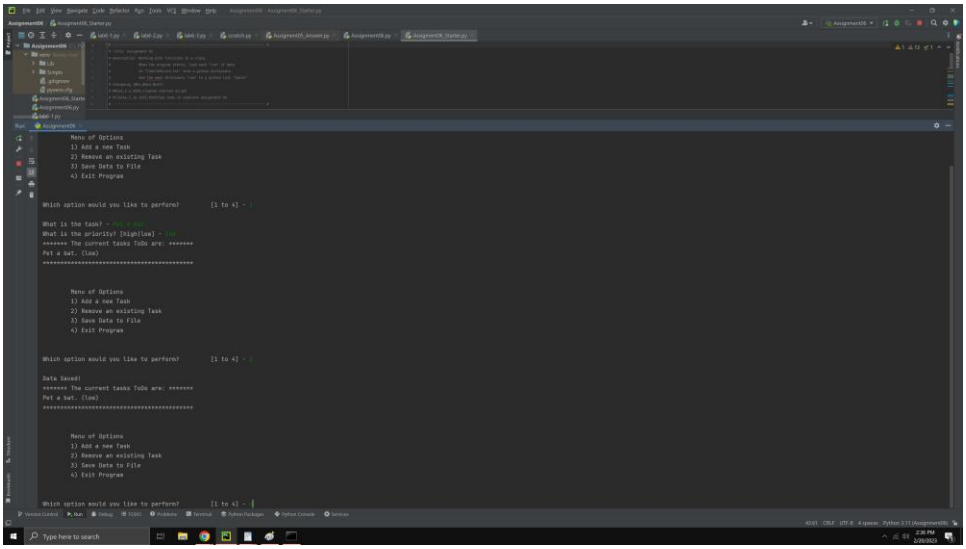

Figure 11. Adding an item to a list via PyCharm.

Assignment 6 in the Command Prompt

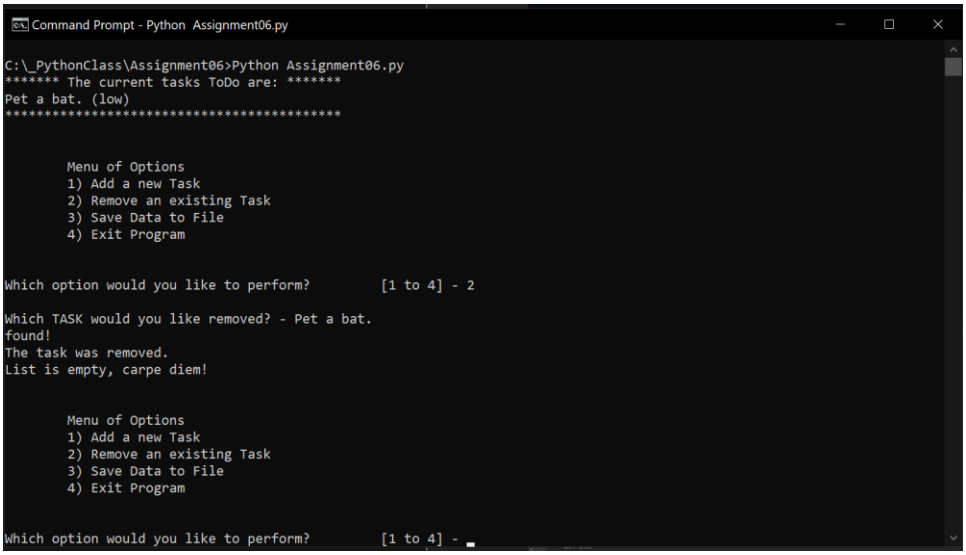

Figure 12. Removing the item from figure 12 via the command prompt.