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November 22, 2022

Foundations Of Programming: Python

Assignment06

GitHub URL: https://github.com/mrtsao1/IntroToProg-Python-Mod06

Data Processing of Text Files using Functions and Classes

Introduction

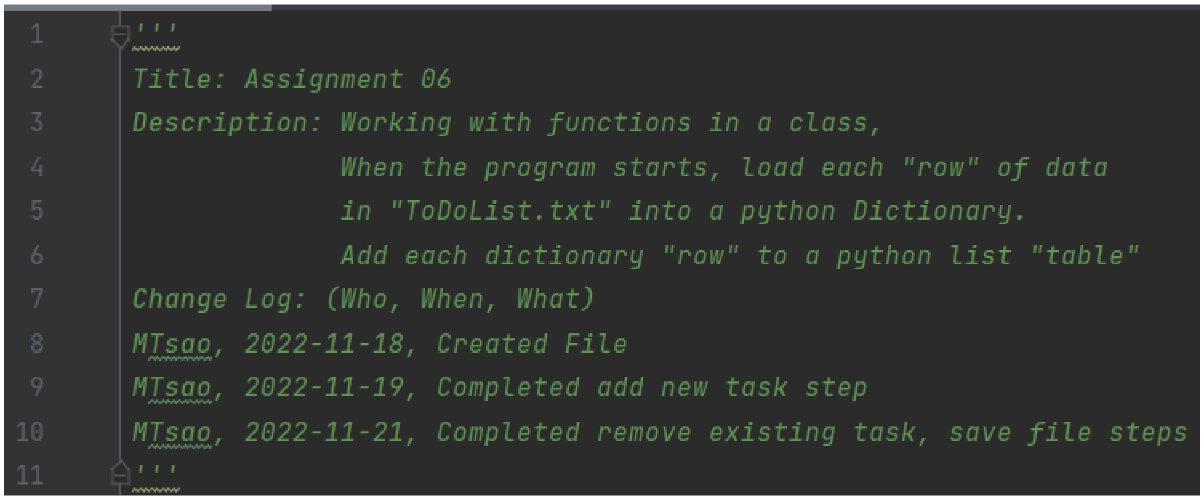
This week, I learned about functions and classes (declaration, calling within your script). I created a program read in data from a text file, format the data into a list of dictionary items, add/remove/display the items in this list, and export this list to a text file. The following information is a breakdown on how I wrote this program step-by-step.

Creating and Running the Program

Refer to the following subsections below.

Script Header

Create the script header. A script header should contain the title of the script file, a description, and a change log. A script header is created using comments, which consists of either starting the line with "#" (single line comment) or multi-line comments (Figure 1).

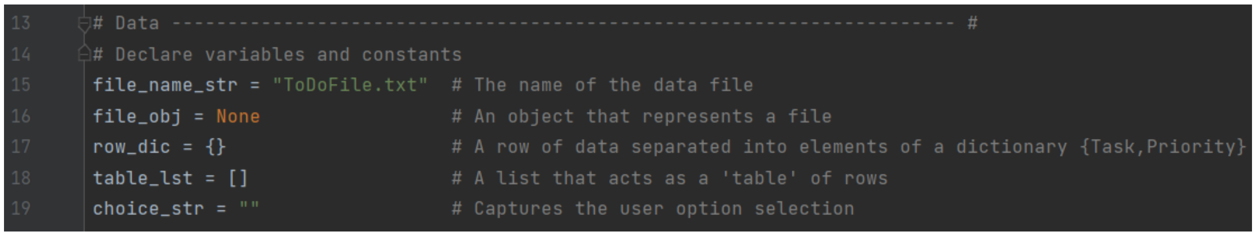


```
'''
Title: Assignment 06
Description: Working with functions in a class,
             When the program starts, load each "row" of data
             in "ToDoList.txt" into a python Dictionary.
             Add each dictionary "row" to a python list "table"
Change Log: (Who, When, What)
MTsao, 2022-11-18, Created File
MTsao, 2022-11-19, Completed add new task step
MTsao, 2022-11-21, Completed remove existing task, save file steps
'''
```

Figure 1. Script Header

Initialize Variables

Create variables with initialized values that will be used throughout the program (Figure 2). The key variables and their descriptions are shown in figure 2 below.



```
# Data ---------------------------------------------------------------------- #
# Declare variables and constants
file_name_str = "ToDoFile.txt"  # The name of the data file
file_obj = None                 # An object that represents a file
row_dic = {}                    # A row of data separated into elements of a dictionary {Task,Priority}
table_lst = []                  # A list that acts as a 'table' of rows
choice_str = ""                 # Captures the user option selection
```

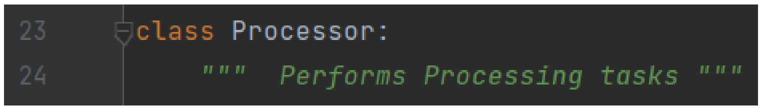
Figure 2. Initialize Variables

Classes

Classes are a way of grouping functions, variables, and constants. In this program, Processor and IO classes will be created and used. See subsections below for more information.

Processor Class

The Processor class is created and will be used to perform processing tasks (Figure 3).

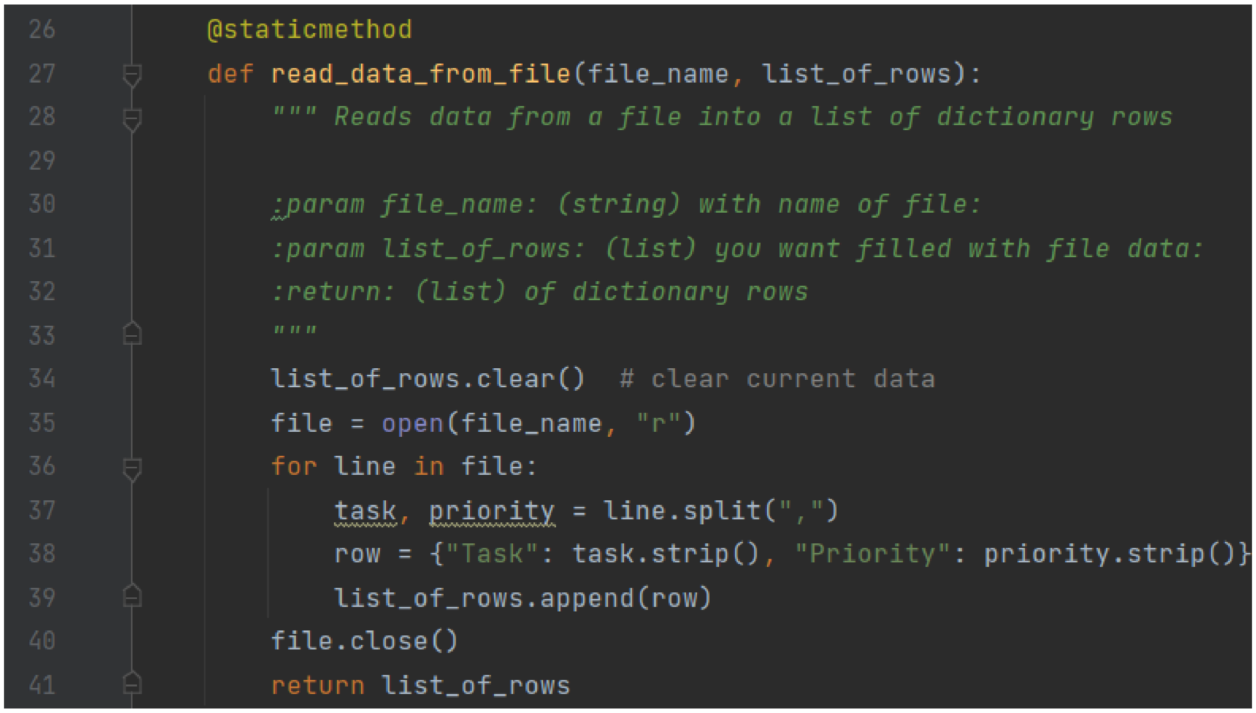


```
class Processor:
    """  Performs Processing tasks """
```

Figure 3. Processor Class

(i) Read Data from File

The “read_data_from_file” function is created and requires two input arguments “file_name” and “list_of_rows” (Figure 4). This function clears any data that was in “list_of_rows”, reads in the data from “file_name” line by line, adds this data to “list_of_rows”, closes the file, and returns the “list_of_rows”.

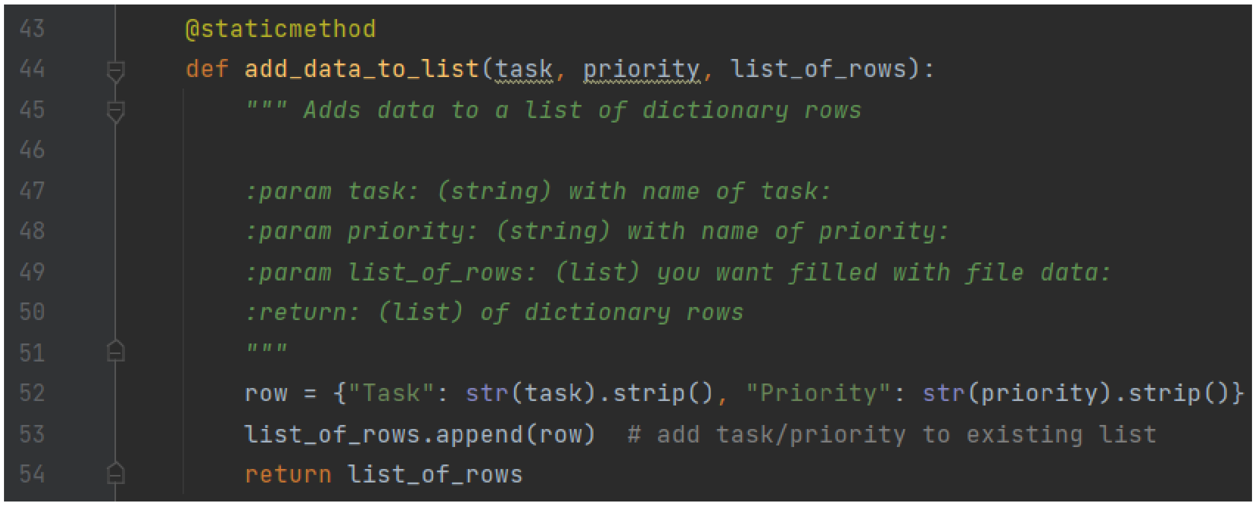


```python
    @staticmethod
    def read_data_from_file(file_name, list_of_rows):
        """ Reads data from a file into a list of dictionary rows

        :param file_name: (string) with name of file:
        :param list_of_rows: (list) you want filled with file data:
        :return: (list) of dictionary rows
        """
        list_of_rows.clear()  # clear current data
        file = open(file_name, "r")
        for line in file:
            task, priority = line.split(",")
            row = {"Task": task.strip(), "Priority": priority.strip()}
            list_of_rows.append(row)
        file.close()
        return list_of_rows
```

Figure 4. read_data_from_file function

(ii) Add Data to List

The "add_data_to_list" function is created and requires three input arguments "task", "priority", and "list_of_rows" (Figure 5). This function formats "task" and "priority" into a dictionary row, appends this row to "list_of_rows", and returns the "list_of_rows".

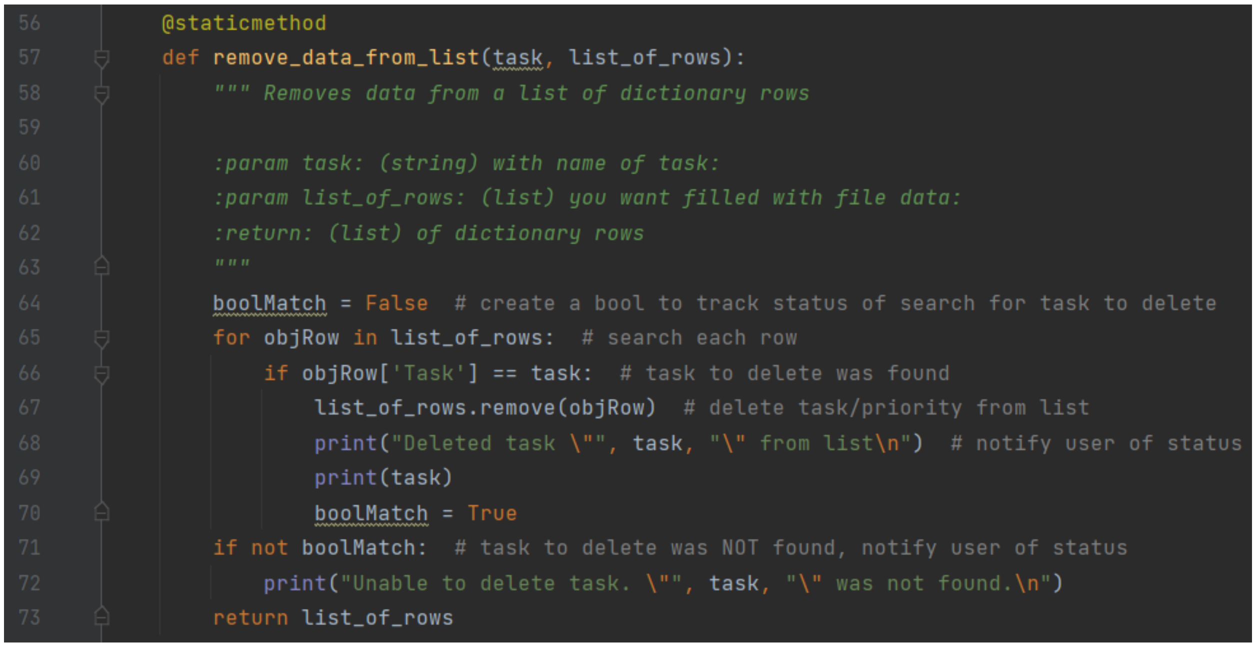


```python
    @staticmethod
    def add_data_to_list(task, priority, list_of_rows):
        """ Adds data to a list of dictionary rows

        :param task: (string) with name of task:
        :param priority: (string) with name of priority:
        :param list_of_rows: (list) you want filled with file data:
        :return: (list) of dictionary rows
        """
        row = {"Task": str(task).strip(), "Priority": str(priority).strip()}
        list_of_rows.append(row)  # add task/priority to existing list
        return list_of_rows
```

Figure 5. add_data_to_list function

(iii) Remove Data from List

The "remove_data_from_list" function is created and requires two input arguments "task" and "list_of_rows" (Figure 6). This function compares each "task" item in "list_of_rows" with input argument "task". If a match is found, the dictionary row with the match will be deleted from "list_of_rows". If a match is NOT found, the user will be notified that the task could not be deleted because it could not be found. The function will then return the “list_of_rows”.

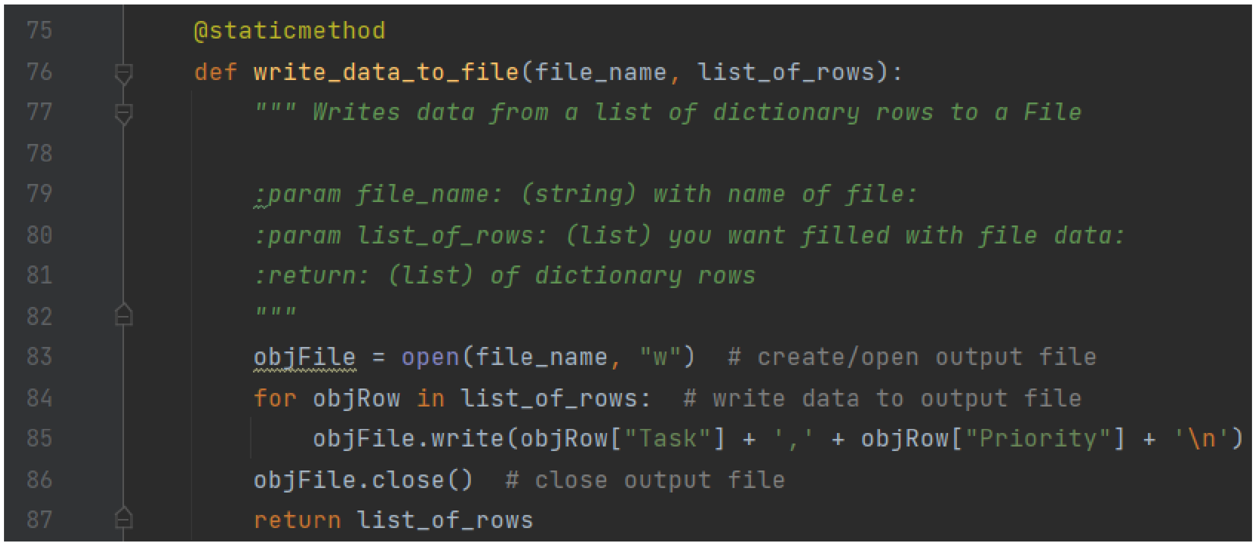


```python
    @staticmethod
    def remove_data_from_list(task, list_of_rows):
        """ Removes data from a list of dictionary rows

        :param task: (string) with name of task:
        :param list_of_rows: (list) you want filled with file data:
        :return: (list) of dictionary rows
        """
        boolMatch = False  # create a bool to track status of search for task to delete
        for objRow in list_of_rows:  # search each row
            if objRow['Task'] == task:  # task to delete was found
                list_of_rows.remove(objRow)  # delete task/priority from list
                print("Deleted task \"", task, "\" from list\n")  # notify user of status
                print(task)
                boolMatch = True
        if not boolMatch:  # task to delete was NOT found, notify user of status
            print("Unable to delete task. \"", task, "\" was not found.\n")
        return list_of_rows
```

Figure 6. remove_data_from_list function

(iv) Write Data to File

The “write_data_to_file” function is created and requires two input arguments “file_name” and “list_of_rows” (Figure 7). This function opens the file “file_name”, writes each dictionary row in “list_of_rows” to the file, closes the file, and returns “list_of_rows”. Any data that previously existed in the file “file_name” is overwritten.

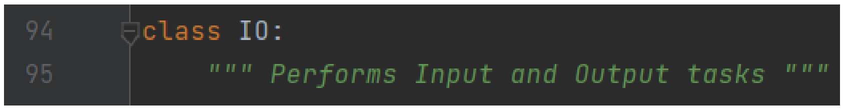


```python
    @staticmethod
    def write_data_to_file(file_name, list_of_rows):
        """ Writes data from a list of dictionary rows to a File

        :param file_name: (string) with name of file:
        :param list_of_rows: (list) you want filled with file data:
        :return: (list) of dictionary rows
        """
        objFile = open(file_name, "w")  # create/open output file
        for objRow in list_of_rows:  # write data to output file
            objFile.write(objRow["Task"] + ',' + objRow["Priority"] + '\n')
        objFile.close()  # close output file
        return list_of_rows
```

Figure 7. write_data_to_file function

IO (Input/Output) Class

The IO class is created and will be used to perform input and output tasks (Figure 8).

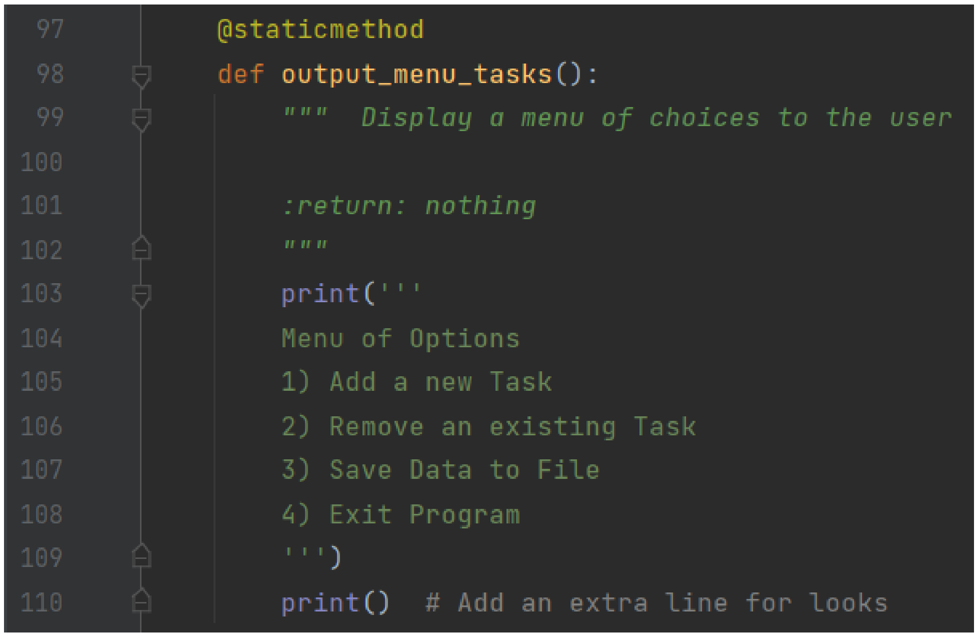


```
class IO:
    """ Performs Input and Output tasks """
```

Figure 8. IO (Input/Output) Class

(i) Output Menu Tasks

The "output_menu_tasks" function is created and contains no input or output arguments (Figure 9). This function prints the menu.

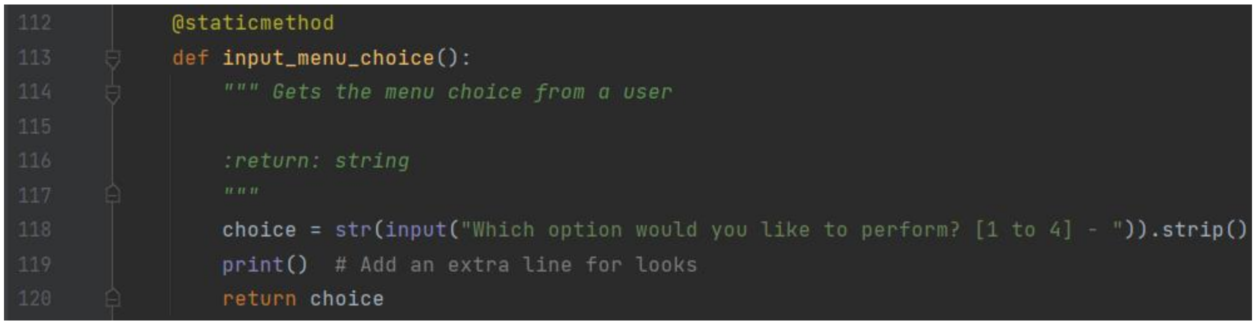


```
    @staticmethod
    def output_menu_tasks():
        """  Display a menu of choices to the user

        :return: nothing
        """
        print('''
        Menu of Options
        1) Add a new Task
        2) Remove an existing Task
        3) Save Data to File
        4) Exit Program
        ''')
        print()  # Add an extra line for looks
```

Figure 9. output_menu_tasks function

(ii) Input Menu Choice

The "input_menu_choice" function is created and contains no input arguments (Figure 10). This function prompts the user to select an option (1 – 4) from menu and returns the user's input.

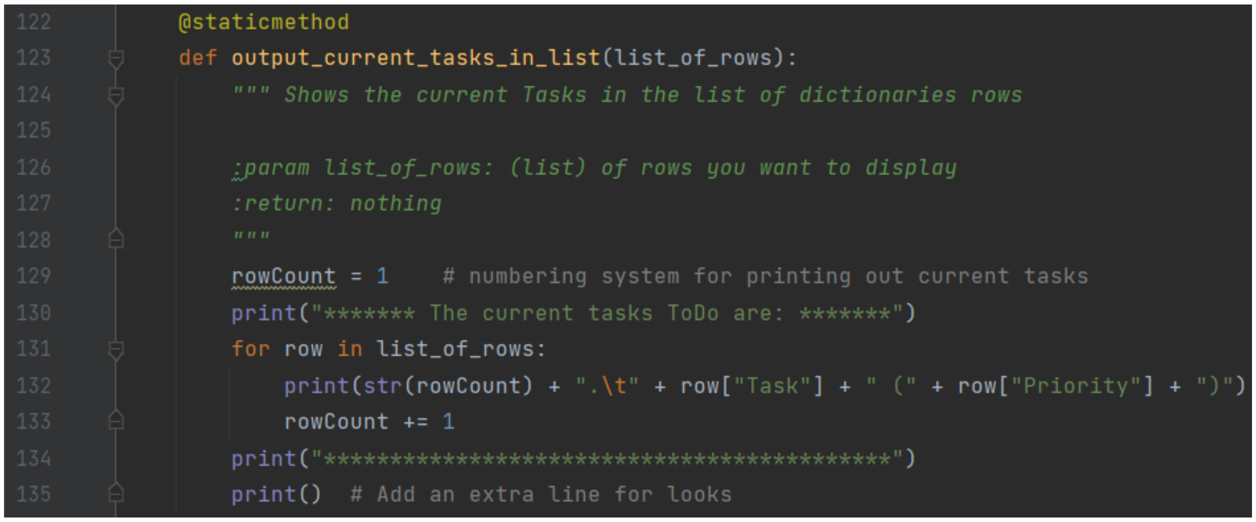


```
    @staticmethod
    def input_menu_choice():
        """ Gets the menu choice from a user

        :return: string
        """
        choice = str(input("Which option would you like to perform? [1 to 4] - ")).strip()
        print()  # Add an extra line for looks
        return choice
```

Figure 10. input_menu_choice function

(iii) Output Current Tasks in List

The “output_current_tasks_in_list” function is created and requires one input “list_of_rows” (Figure 11). This function prints the tasks and priority of the items in “list_of_rows". No output arguments for this function.

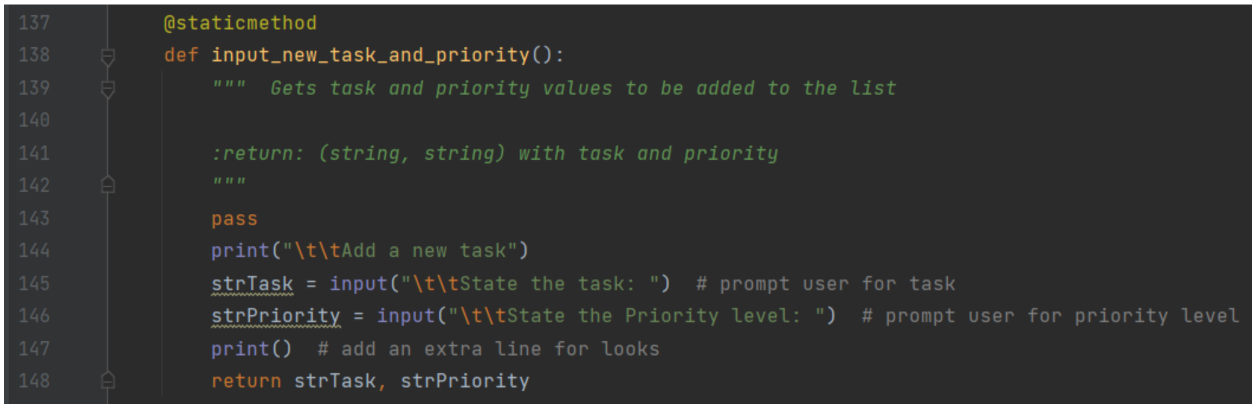


```python
    @staticmethod
    def output_current_tasks_in_list(list_of_rows):
        """ Shows the current Tasks in the list of dictionaries rows

        :param list_of_rows: (list) of rows you want to display
        :return: nothing
        """
        rowCount = 1    # numbering system for printing out current tasks
        print("******* The current tasks ToDo are: *******")
        for row in list_of_rows:
            print(str(rowCount) + ".\t" + row["Task"] + " (" + row["Priority"] + ")")
            rowCount += 1
        print("*******************************************")
        print()  # Add an extra line for looks
```

Figure 11. output_current_tasks_in_list function

(iv) Input New Task and Priority

The “input_new_task_and_priority” function is created and requires no input arguments (Figure 12). This function prompts the user for the task and priority level and returns the user’s inputs.

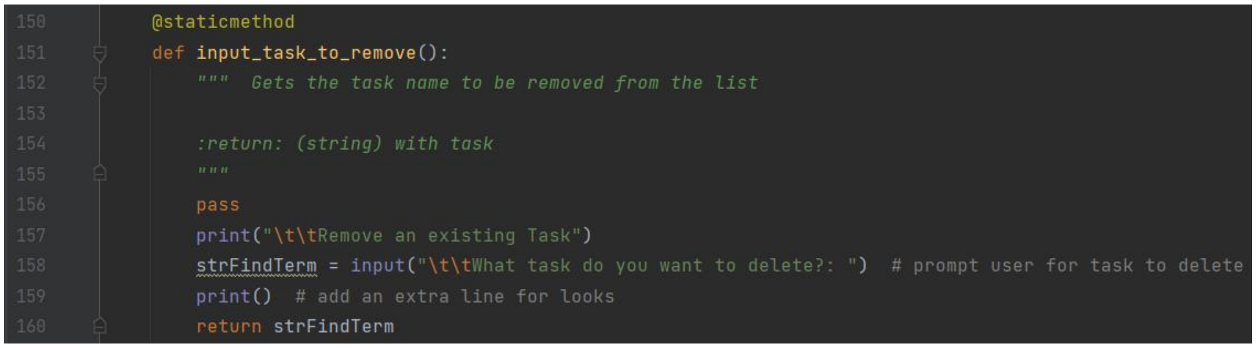


```python
    @staticmethod
    def input_new_task_and_priority():
        """  Gets task and priority values to be added to the list

        :return: (string, string) with task and priority
        """
        pass
        print("\t\tAdd a new task")
        strTask = input("\t\tState the task: ")  # prompt user for task
        strPriority = input("\t\tState the Priority level: ")  # prompt user for priority level
        print()  # add an extra line for looks
        return strTask, strPriority
```

Figure 12. input_new_task_and_priority function

(v) Input Task to Remove

The “input_task_to_remove” function is created and requires no input arguments (Figure 13). This function prompts user for task that they want to delete and returns the user’s input.



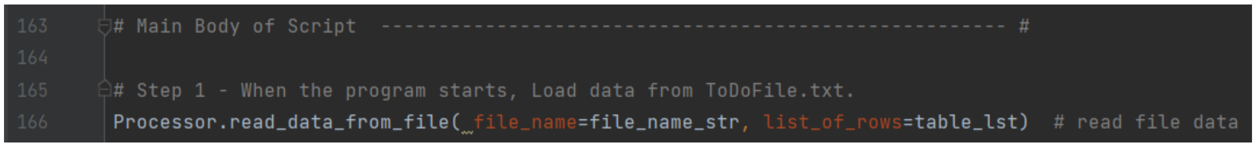
```
    @staticmethod
    def input_task_to_remove():
        """  Gets the task name to be removed from the list

        :return: (string) with task
        """
        pass
        print("\t\tRemove an existing Task")
        strFindTerm = input("\t\tWhat task do you want to delete?: ")  # prompt user for task to delete
        print()  # add an extra line for looks
        return strFindTerm
```

Figure 13. input_task_to_remove function

Main Body of Script

Load Data from Text File

This section imports the data from the data file by calling the “read_data_from_file” function from the Processor class (Figure 14).

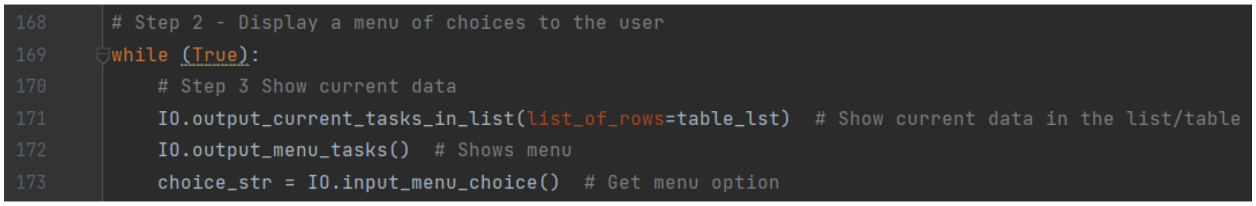


```
# Main Body of Script  ------------------------------------------------------- #

# Step 1 - When the program starts, Load data from ToDoFile.txt.
Processor.read_data_from_file(file_name=file_name_str, list_of_rows=table_lst)  # read file data
```

Figure 14. Read in Data from File

Select Option From Menu

The program will call the “output_current_tasks_in_list” and “output_menu_tasks” functions from the IO class to display the current data followed by the menu. Then, the “input_menu_choice” function from the IO class will be called, prompting the user to choose an option from the menu (Figure 15). This process will be repeated until the user exits the program.



```
# Step 2 - Display a menu of choices to the user
while (True):
    # Step 3 Show current data
    IO.output_current_tasks_in_list(list_of_rows=table_lst)  # Show current data in the list/table
    IO.output_menu_tasks()  # Shows menu
    choice_str = IO.input_menu_choice()  # Get menu option
```

Figure 15. Select Option from Menu

Evaluate Selected Option

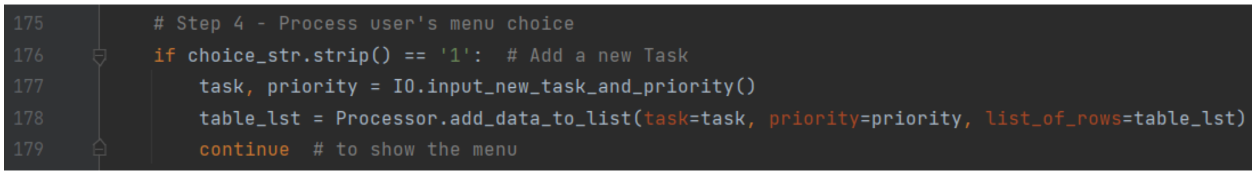
The menu choices are:

1) Add a New Item
2) Remove an Existing Item
3) Save Data to File
4) Exit Program

The program uses an if/elif…/else statement to evaluate the user’s choice. These menu options are explored in the subsections below.

(i) Add a New Item

The user entered “1” to add a new item to the list. The program will call the “input_new_task_and_priority” function from the IO class to prompt the user to enter the “task” and “priority”. The program will take the inputs, format them into a dictionary item, and append it to the existing list using “add_data_to_list” function from the Processor class (Figure 16).

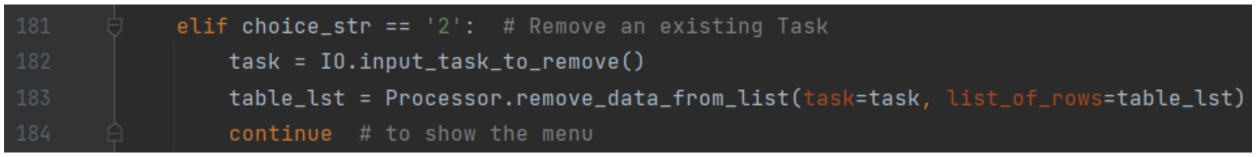


```
    # Step 4 - Process user's menu choice
    if choice_str.strip() == '1':  # Add a new Task
        task, priority = IO.input_new_task_and_priority()
        table_lst = Processor.add_data_to_list(task=task, priority=priority, list_of_rows=table_lst)
        continue  # to show the menu
```

Figure 16. Add a New Item

(ii) Remove an Existing Item

The user entered “2” to remove an item from the list (Figure 17). The program will call the “input_task_to_remove” function from the IO class to prompt the user to enter the “task” name. Then, the program will call the “remove_data_from_list” function from the Processor class using the user input and existing list “table_list” as input arguments.

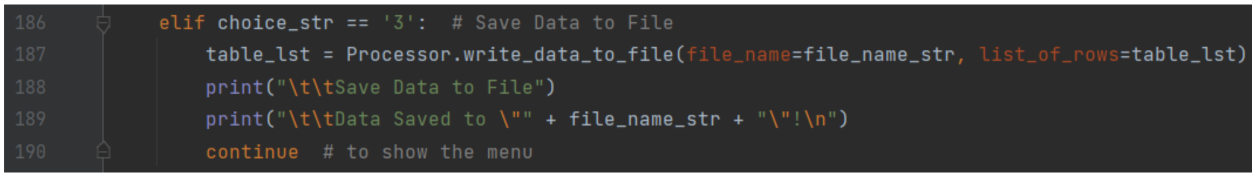


```
    elif choice_str == '2':  # Remove an existing Task
        task = IO.input_task_to_remove()
        table_lst = Processor.remove_data_from_list(task=task, list_of_rows=table_lst)
        continue  # to show the menu
```

Figure 17. Remove an Existing Item

(iii) Save Data to File

The user entered “3” to save the data to output file (Figure 18). The program calls the “write_data_to_file” function from the Processor class to save the task list to the data file. Any data that previously existed in the output file will be overwritten. The user will be notified that the data has been saved to the output file.

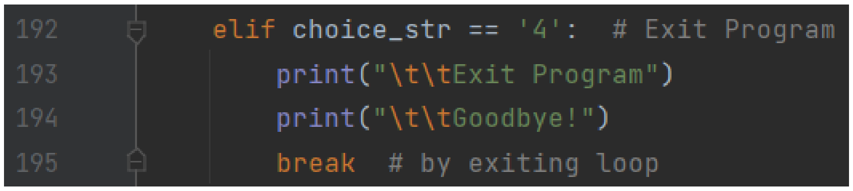


```
    elif choice_str == '3':  # Save Data to File
        table_lst = Processor.write_data_to_file(file_name=file_name_str, list_of_rows=table_lst)
        print("\t\tSave Data to File")
        print("\t\tData Saved to \"" + file_name_str + "\"!\n")
        continue  # to show the menu
```

Figure 18. Save Data to File

(iv) Exit Program

The user entered “4” to exit the program (Figure 19). The program will display “Exit Program” and “Goodbye!” to the user before terminating.

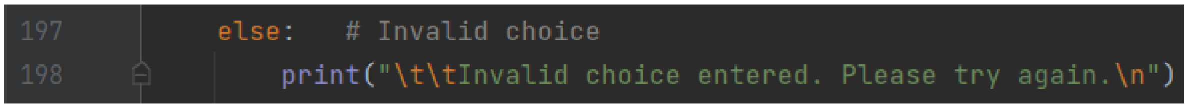


```
    elif choice_str == '4':  # Exit Program
        print("\t\tExit Program")
        print("\t\tGoodbye!")
        break  # by exiting loop
```

Figure 19. Exit Program

(v) Invalid Choice

If the user input was not “1” through “4”, the user will see the message “Invalid choice entered. Please try again.” and will be prompted to make another selection (Figure 20).

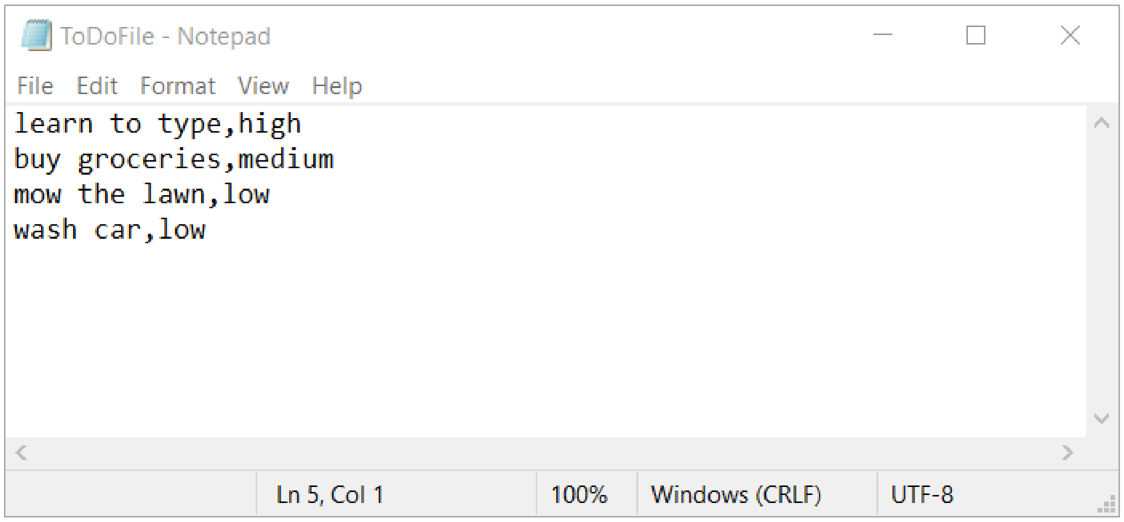


```
    else:   # Invalid choice
        print("\t\tInvalid choice entered. Please try again.\n")
```

Figure 20. Invalid Choice

Verify Program Worked

My sample input file “ToDoList.txt” contains 4 items of data (Figure 21). I used this sample file to test my program in PyCharm and OS command/shell window.



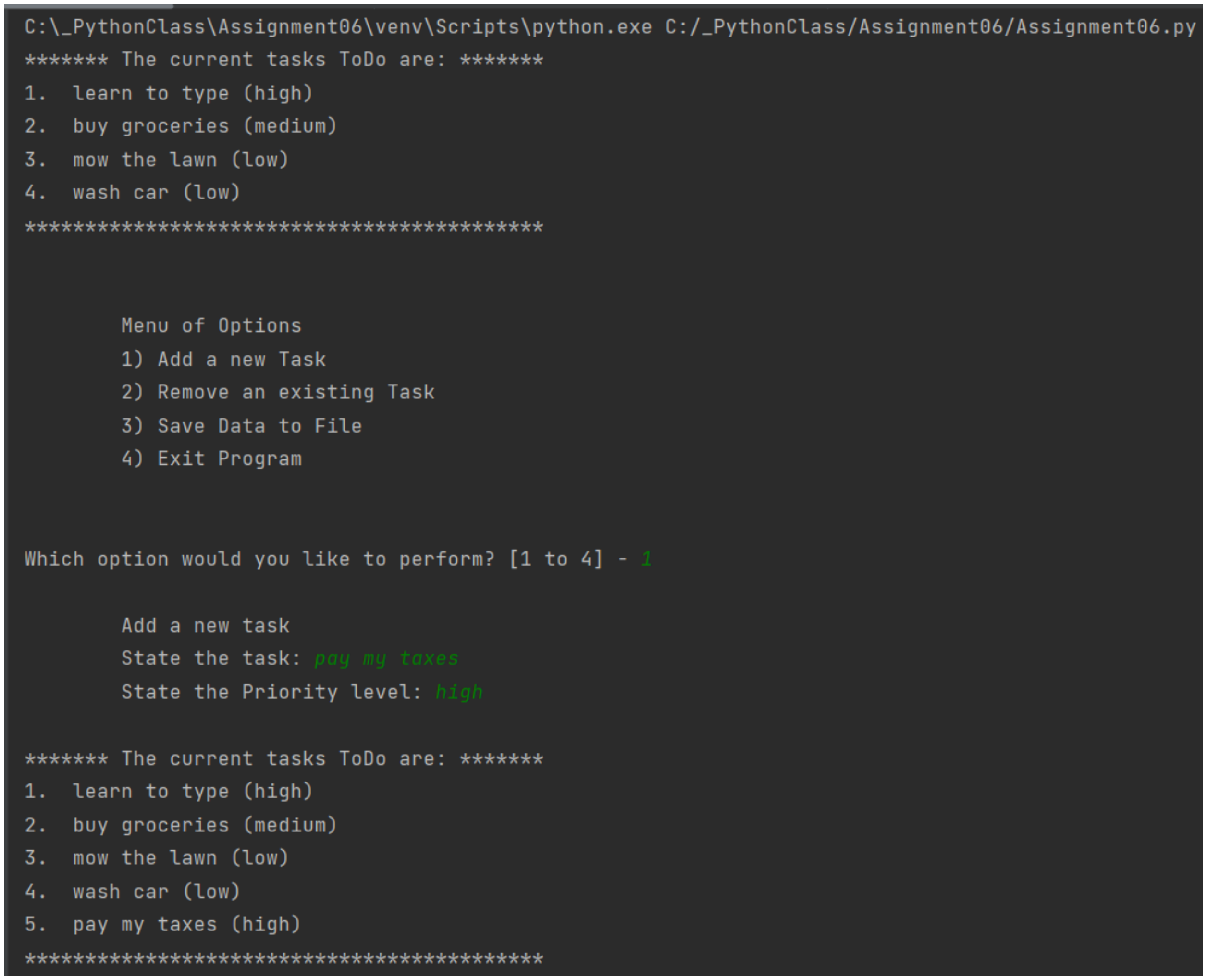
```
learn to type,high
buy groceries,medium
mow the lawn,low
wash car,low
```

Figure 21. ToDoList.txt

Run Program Using PyCharm

(i) Add a New Item

Run script in PyCharm and add item to list, showing that the script worked as expected (Figure 23).

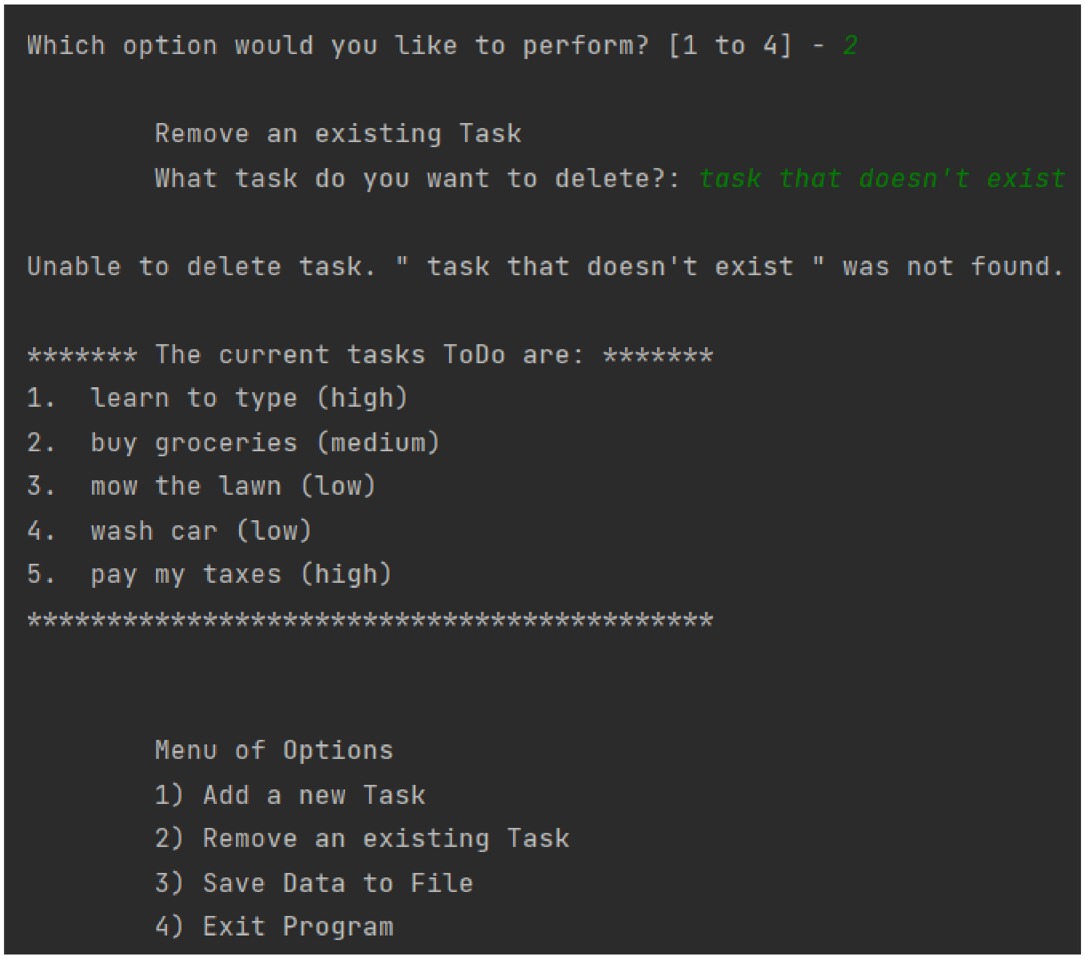


```
C:\_PythonClass\Assignment06\venv\Scripts\python.exe C:/_PythonClass/Assignment06/Assignment06.py
******* The current tasks ToDo are: *******
1.  learn to type (high)
2.  buy groceries (medium)
3.  mow the lawn (low)
4.  wash car (low)
*******************************************



        Menu of Options
        1) Add a new Task
        2) Remove an existing Task
        3) Save Data to File
        4) Exit Program


Which option would you like to perform? [1 to 4] - 1

        Add a new task
        State the task: pay my taxes
        State the Priority level: high

******* The current tasks ToDo are: *******
1.  learn to type (high)
2.  buy groceries (medium)
3.  mow the lawn (low)
4.  wash car (low)
5.  pay my taxes (high)
*******************************************
```

Figure 22. PyCharm - Add new item to list

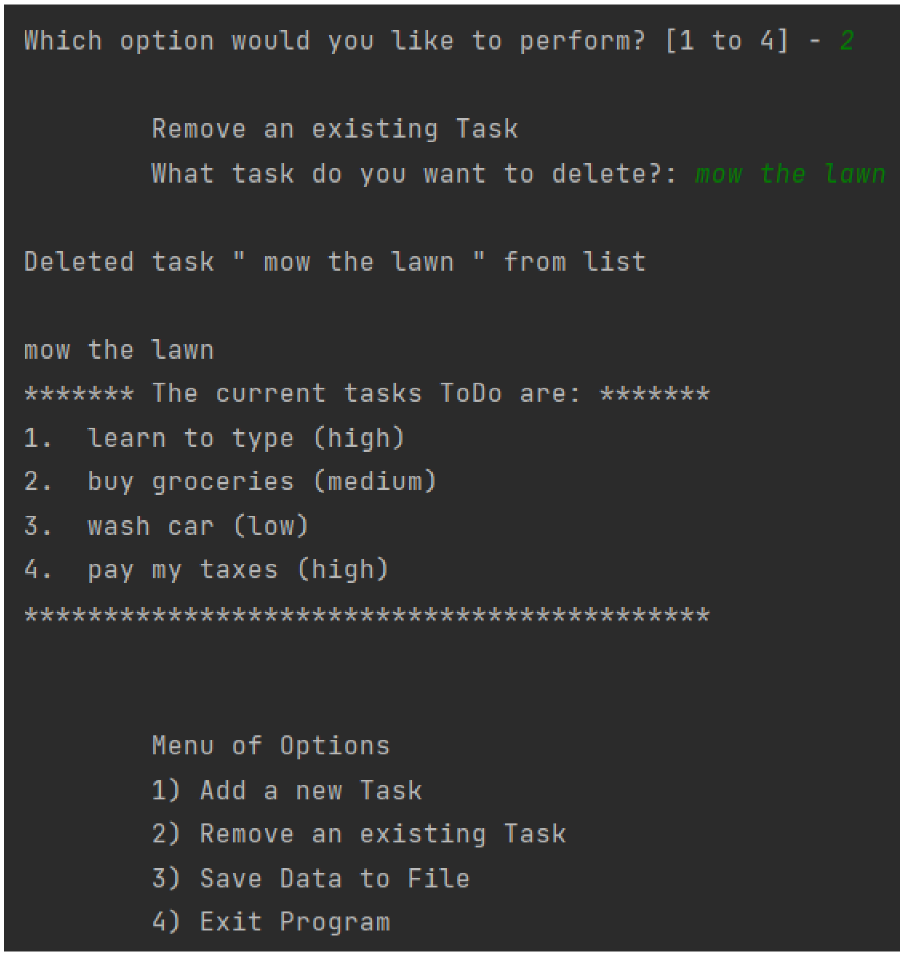
(ii) Remove an existing Item

The user attempts to delete a task that is not in the list (Figure 24). The user deletes a task that exists in the list (Figure 25).



```
Which option would you like to perform? [1 to 4] - 2

        Remove an existing Task
        What task do you want to delete?: task that doesn't exist

Unable to delete task. " task that doesn't exist " was not found.

******* The current tasks ToDo are: *******
1.  learn to type (high)
2.  buy groceries (medium)
3.  mow the lawn (low)
4.  wash car (low)
5.  pay my taxes (high)
*******************************************


        Menu of Options
        1) Add a new Task
        2) Remove an existing Task
        3) Save Data to File
        4) Exit Program
```

Figure 23. Delete a task that DOES NOT exist

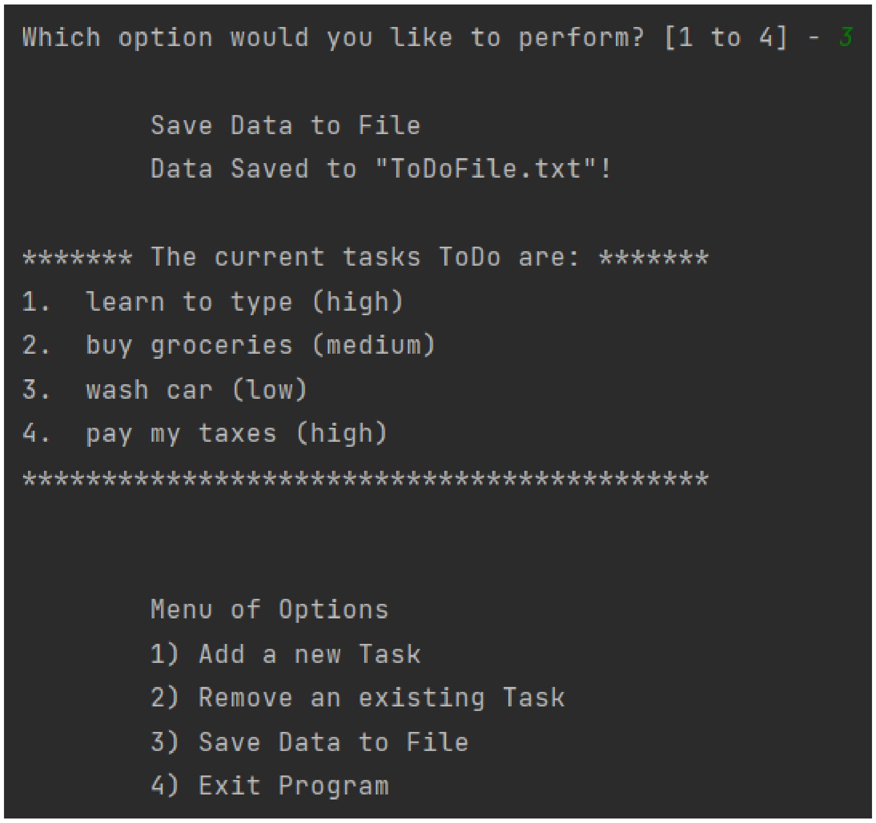


```
Which option would you like to perform? [1 to 4] - 2

        Remove an existing Task
        What task do you want to delete?: mow the lawn

Deleted task " mow the lawn " from list

mow the lawn
******* The current tasks ToDo are: *******
1.  learn to type (high)
2.  buy groceries (medium)
3.  wash car (low)
4.  pay my taxes (high)
*******************************************



        Menu of Options
        1) Add a new Task
        2) Remove an existing Task
        3) Save Data to File
        4) Exit Program
```

Figure 24. Delete a task that DOES exist

(iii) Save Data to File

The user saves the data to output file "ToDoList.txt" (Figure 25).

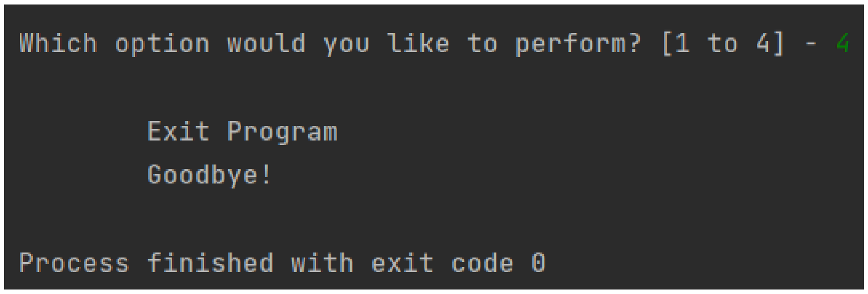


```
Which option would you like to perform? [1 to 4] - 3

        Save Data to File
        Data Saved to "ToDoFile.txt"!

******* The current tasks ToDo are: *******
1.  learn to type (high)
2.  buy groceries (medium)
3.  wash car (low)
4.  pay my taxes (high)
*******************************************


        Menu of Options
        1) Add a new Task
        2) Remove an existing Task
        3) Save Data to File
        4) Exit Program
```

Figure 25. Save Data to File

(iv) Exit Program

The user exits the program(Figure 26). The program prompts the user to press enter on the line stating "Press the enter key to exit.".

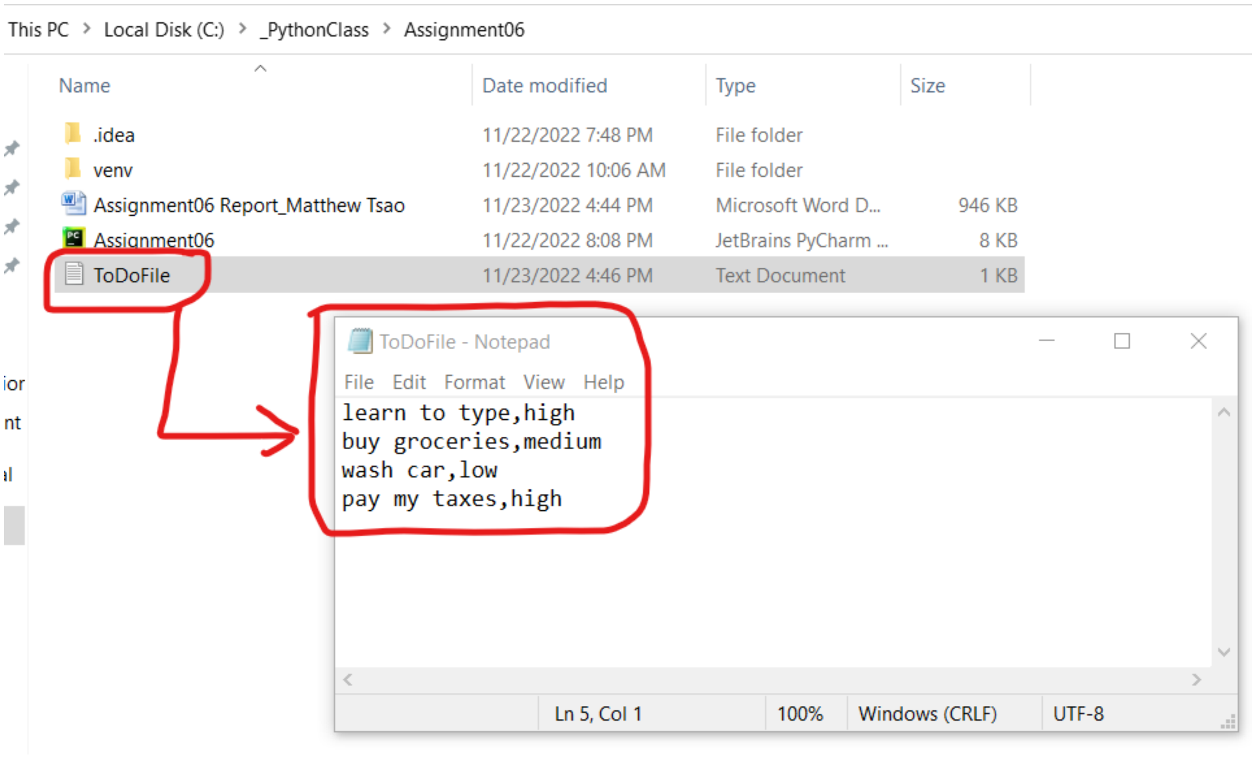


```
Which option would you like to perform? [1 to 4] - 4

        Exit Program
        Goodbye!

Process finished with exit code 0
```

Figure 26. Exit Program

(v) Verify Contents of Output File

Check to verify that the output file was created with data as expected (Figure 27).


This PC > Local Disk (C:) > _PythonClass > Assignment06

Name	Date modified	Type	Size
.idea	11/22/2022 7:48 PM	File folder	
venv	11/22/2022 10:06 AM	File folder	
Assignment06 Report_Matthew Tsao	11/23/2022 4:44 PM	Microsoft Word D...	946 KB
Assignment06	11/22/2022 8:08 PM	JetBrains PyCharm ...	8 KB
ToDoFile	11/23/2022 4:46 PM	Text Document	1 KB

ToDoFile - Notepad

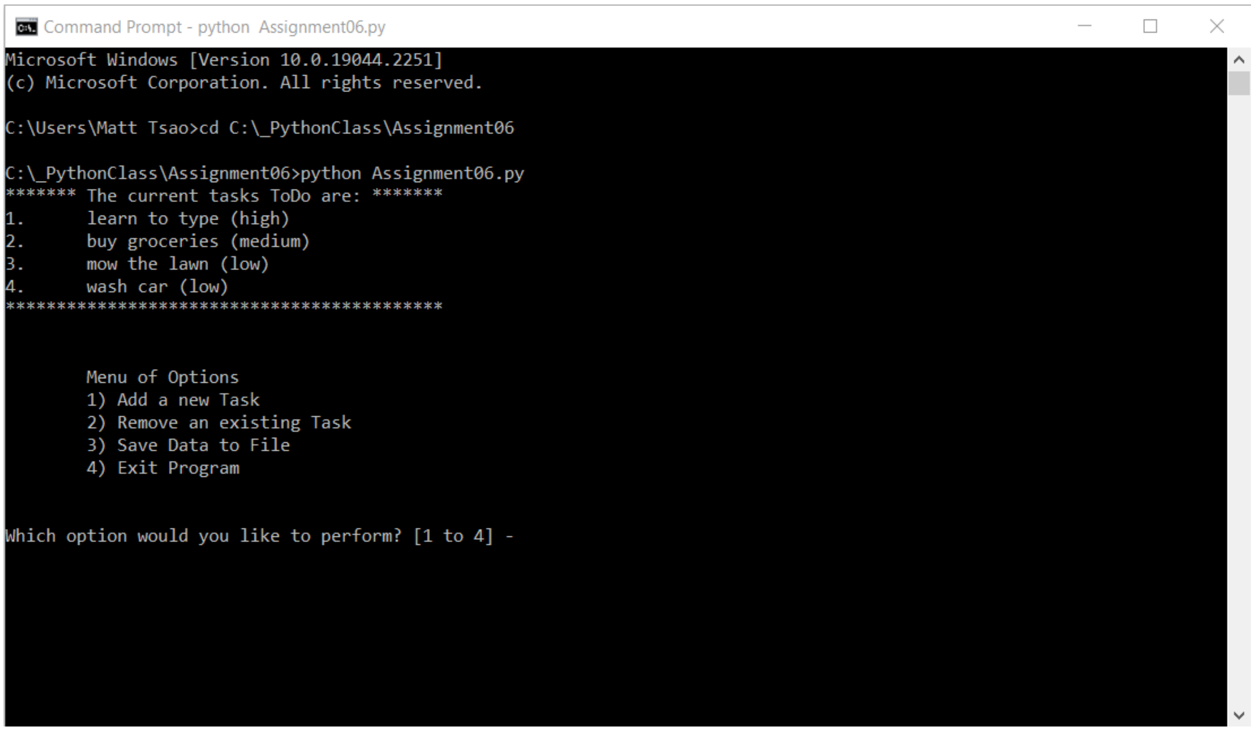
```
learn to type,high
buy groceries,medium
wash car,low
pay my taxes,high
```

Ln 5, Col 1 100% Windows (CRLF) UTF-8

Figure 27. Verification of Output File

Run Program Using OS command/shell window

Snip of Assignment06.py running using shell window (Figure 28).


Command Prompt - python Assignment06.py

```
Microsoft Windows [Version 10.0.19044.2251]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Matt Tsao>cd C:\_PythonClass\Assignment06

C:\_PythonClass\Assignment06>python Assignment06.py
******* The current tasks ToDo are: *******
1.      learn to type (high)
2.      buy groceries (medium)
3.      mow the lawn (low)
4.      wash car (low)
*******************************************


        Menu of Options
        1) Add a new Task
        2) Remove an existing Task
        3) Save Data to File
        4) Exit Program


Which option would you like to perform? [1 to 4] -
```

Figure 28. Run Assignment06.py in shell window

Summary

The Assignment06.py program demonstrated the following concepts:

- Introduction to functions and classes
- Data manipulation using dictionaries (Add/remove dictionary entries)
- TODO comment to keep track of status when developing scripts
- Comparisons of user inputs to stored data entries to determine if an item exists within a list