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Spring 2022 - IT FDN 110 – Python
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https://github.com/navisandhu7/IntroToProg-Python-Mod07/
https://navisandhu7.github.io/IntroToProg-Python-Mod07/

Assignment 07
Pickling Data and Structured Error Handling

INTRODUCTION

For the seventh assignment for IT FDN 110, students were tasked with demonstrating data pickling and structured error handling by creating a new code of their choice. This document will describe the process I took and code I wrote to successfully accomplish this task. My code was written to assist in scheduling events. It uses a similar structure to the "To Do List" manager of the previous weeks, but has the added wrinkles of using the "datetime" module and enjoys lots of possible error points that can be handled. There is also a benefit to having schedule data pickled as this imposes a pseudo-encryption that ensures the basics of one's schedule are not openly available unless using the code itself.

CODE WALKTHROUGH & REASONING

Figure 1 shows the code written to perform the specified function. The first several lines encompass the header of the code, which is self-explanatory and will not be covered in detail in this document. The rest of the code will be explained by section: Data, Processing, and I/O.

DATA

The first section of code encompasses initialization of any variables that will be used later in the code. It also imports other modules of code used in the script. These import statements import the pickling module for use in pickling data. The *sys* module is imported due to use of the *sys.exit()* function, which is used for structured error handling of a severe scenario. The *datetime* module is imported as *dt*, as *datetime* objects are used to store date and time information for different events that are input into one's schedule. Several variables are initialized, almost all blank, except for *fileName*. This variable holds the default file name for the scheduling data binary file, which is *MySchedule.dat.*

PROCESSING

The second section of code defines the "Processor" class and several functions that perform different tasks in the code. There are four functions in this section.

The first function is *read_pickled_data*, which reads any existing pickled data from the file *file_name,* which is *MySchedule.dat* by default. This function starts by trying to open the binary file in read mode. If the file does not exist, this will throw a *FileNotFoundError* in Python, which is handled via an *except* statement. The information for this error is passed to the function in the Input/Output portion of the code called *error_message*, which then spits out a message to user based on the input argument *e*. In this instance, if the file *MySchedule.dat* does not exist, the *sys.exist()* function is called to immediately end the program and display a message to the user that the binary file is required, even if empty, prior to starting the program. The program cannot run without this file. In a future expansion, it would be simple to add a block of code that asks the user if they would like the system to create a new schedule file and then start, however this was not included in this script for the sake of demonstrative simplicity. If the file exists, its contents are read into the *data* variable, which is then returned to the main body. Reading a pickled file line-by-line will create an *EOFError*, or "end of file error," and thus this is handled by calling the *error_message* function, which calls the *pass* statement to essentially ignore this error.

The second and third functions are *add_event_to_schedule* and *remove_event*. These functions either add or remove an event in the form of dictionary rows from a supplied list of scheduling data. These functions are very similar to the previous two weeks of creating a to-do list manager and will not be covered in detail in this document. More information on the guts of these functions can be found in the previous documentation.

The final function in this class is the *pickle_data* function. It takes in arguments of *file_name* (default: *MySchedule.dat*) and *data* (default: empty list) and writes the data in *data* to a binary file of name *file_name* in the local code directory. This is programmatically very simple, as pickling data simply involves calling the *pickle.dump()* function on a valid, open binary file *f*. This is all these four lines of code do, and then the file *f* is closed and the function completes with no return values.

INPUT/OUTPUT

This section of code defines all of the I/O necessary to achieve the functionality of the code, mostly consisting of print and input statements, though the main error handling function is also housed in this class.

The first function is a simple *welcome_message* that prints a message to the user when the code is first started up explaining what the code does and prompting the user to choose a menu option. There are no parameters or returns.

The second function is similar in its simplicity. The *display_menu* function prints the menu to the user for selecting an option between 1 and 5 to perform the various tasks of the program. There are no parameters or returns.

The third function, *get_menu_input*, returns the user's choice for the menu in the parameter *choice*.

The fourth function is the main error handling function in the script, *error_message*. At most common error-prone points (where the user makes an input), a *try-except* format is used. If an error is returned from these areas, the error information is stored in the variable *e* and passed to this function. This function determines what type of error *e* is and returns a message based on that information. In most cases, the built-in Python error information is not displayed to the user for simplicity, as most mistakes are easily corrected by the user by trying their input again. Because this program is based on file I/O and user input of values (menu options, date and time of events), the most common errors are file errors (*EOFError* and *FileNotFoundError*) or *ValueErrors*, where the user's input is not within the bounds of useability for the code. There is one custom *Exception* error in this code, which is raised when the user inputs a menu option that is an integer, but not within the bounds of the menu (i.e., if the entered integer is not between 1 and 5). In this case, a custom error message is displayed, prompting the user to only enter an integer between 1 and 5 for the main menu.

The fifth function in this class displays existing schedule data in the parameter *data* to the user on-screen. This is achieved by looping through the dictionary rows of *data* and printing them to the user. Some formatting must be done on the *datetime* object stored in the *Time* key for each row of data. This is part of the *datetime* module and converts the *datetime* object to a string such that it can be concatenated and displayed to the user in a viewing-friendly format. There are no returned parameters in this function.

The sixth function, *get_user_event_time*, incorporates the *datetime* module. The user is prompted for the name of an event and the time of the event they would like to add to their schedule. There are no parameters for this function. The user is asked to supply the time in a specific formatting (MM/DD/YYYY for date and HH:MM for time of day) such that the information can be easily converted to integers and fed into the *datetime.datetime* function to convert the integers to a *datetime* object. This format ensures the time is controlled and is not subject to being split or lost in translation, as every event time is treated as a single *datetime* object instead of a string of separate characters. Each integer entered by the user must be within the range of normal time (1-31 days in a month, 1-12 months in a year, years 1-9999 due to the limitations of the *datetime* module, *0-23* hours per day in a 24-hour format, and 0-59 minutes in an hour). If a non-integer is entered for any of these parameters, a *ValueError* is raised and handled per the *error_message* function. If any of the integers are out of bounds, the program loops and the user must try the time entry again. If successful, the information is converted into a *datetime* object and both this object and the event are returned to the main body via the parameters *event* and *time*.

The seventh and eighth functions are very simple in operation. The *get_event_to_remove* function returns a string input from the user for the name of an event they'd like to remove from their schedule, while the *exit_message* function displays a message to the user prior to the program ending.

MAIN BODY

The main body of the script starts by calling the *read_pickled_data* function from the *process* class and storing the returned information in the variable *scheduleData*. This variable serves as the main vessel for schedule data as it is manipulated through the code. The function is fed the *fileName* variable, which is assigned to *MySchedule.dat* in the data portion of the code.

Next, the *welcome_message* function is called to present a welcome message to the user. The process of displaying this message and initializing the *scheduleData* variable only occur once for every code run.

The remainder of the code is wrapped in an infinite loop, such that the user can continually make menu choices as long as they do not explicitly choose to exit the program. If the user enters a non-integer option for their menu input (retrieved via a call to *get_menu_input*), then a *ValueError* is raised and handled. If an integer is entered but it is out of range, then a custom error is raised and the user is told to restrict inputs to integers between 1 and 5. In both cases, the menu is displayed again and the user may make another input for menu option.

If a valid menu option is entered, a *match-case* system is used to handle the different choices. This is formatting that was introduced in Python 3.10 and is similar in operation to the *switch-case* format in other coding languages. Essentially, the code uses the variable tagged to *match* and examines which *case* it is equal to and will execute the code in that *case* block and that block only. Then, due to the infinite loop, the code will loop back up to the menu and the process will continue. This structure is very similar to the *if-elif-else* structure but provides a more streamlined option for menu-driven programs and enhances code clarity. This *match-case* section encompasses the bulk of the code being called based on the user menu choices and is done in under 15 lines.

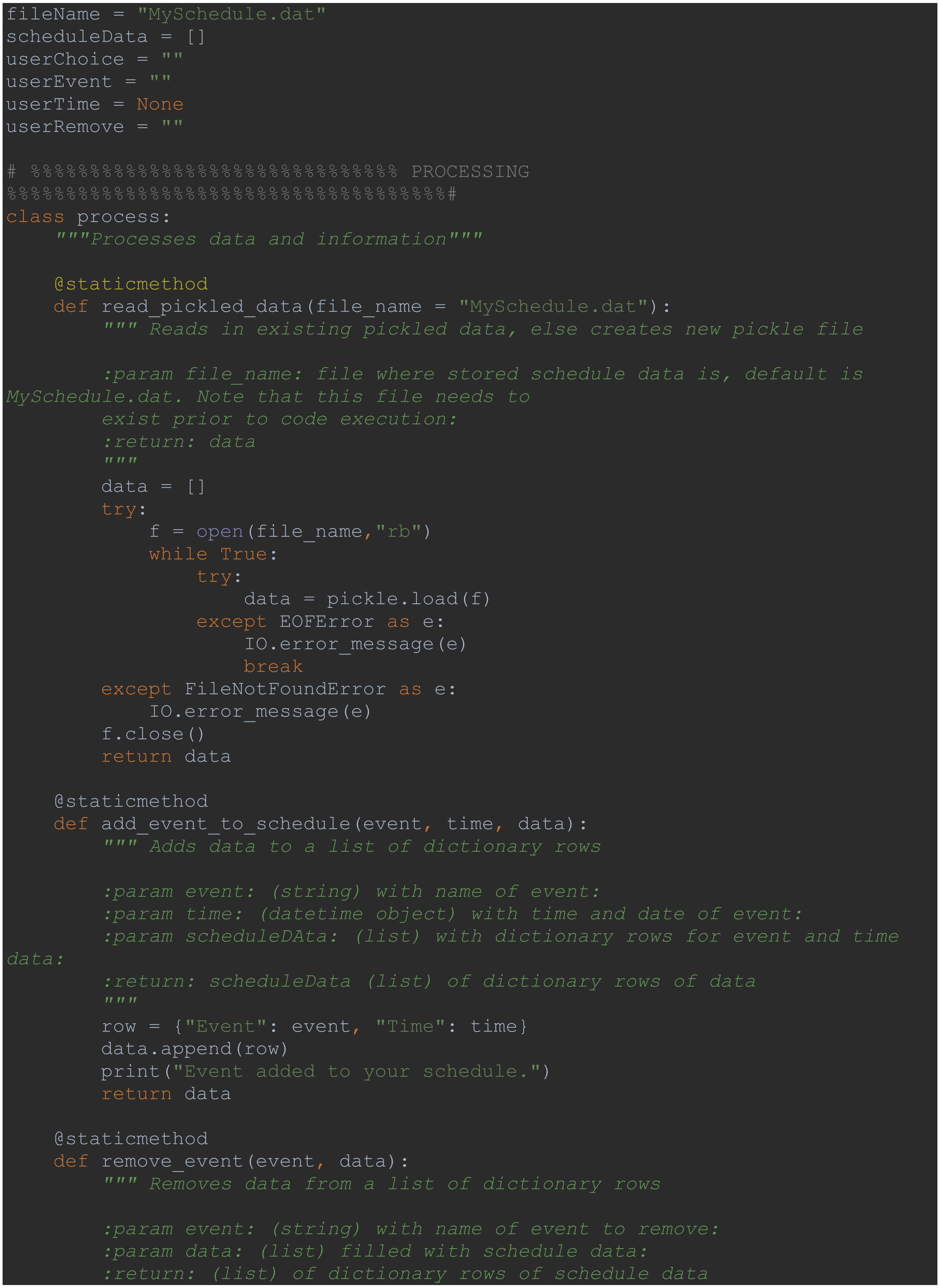
The details of each case are self-explanatory based on the functions being called in the menu and are not covered in detail in this section of documentation. If the user chooses menu option 5, the code breaks from the infinite loop and ends upon a user input.

Operation of the code in both PyCharm and the Windows Command Console is given in Figs. 2 through 10.

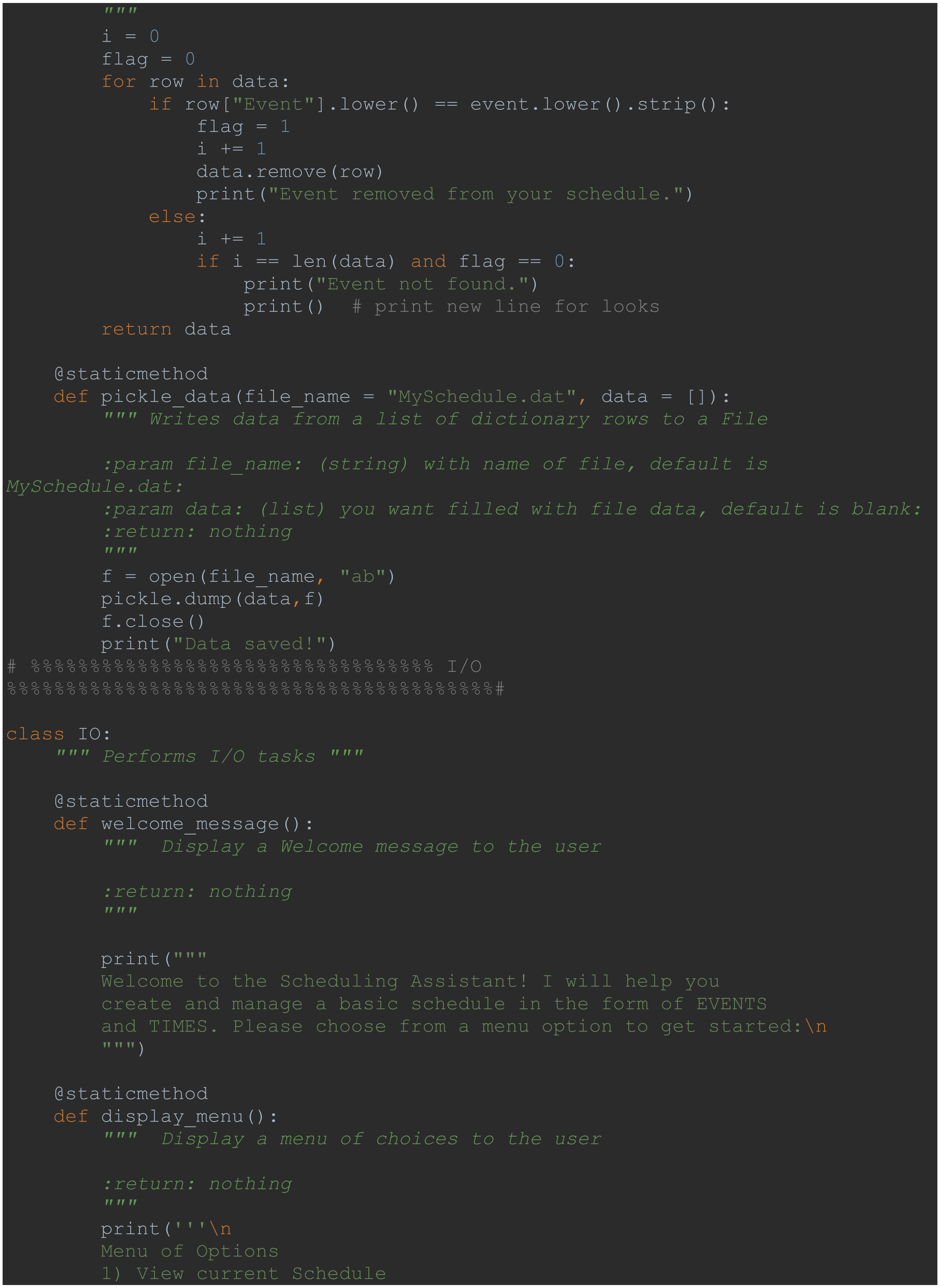
SUMMARY

In summary, this document describes the code behind a successful demonstration code for data pickling and structured error handling. The demonstration is wrapped in a simple scheduling assistant code. Several common errors in the code are handled such that user-friendly error messages are displayed and the code continues to run rather than breaking and displaying high-level error information. Data is successfully pickled and unpickled from a binary file, as shown in the Figs. 2 through 10. Several other common coding tools are also utilized, such as the import of the *sys* and *datetime* modules as well as the use of the *match-case* structure in the main body of the code as opposed to the *if-elif-else* structure.

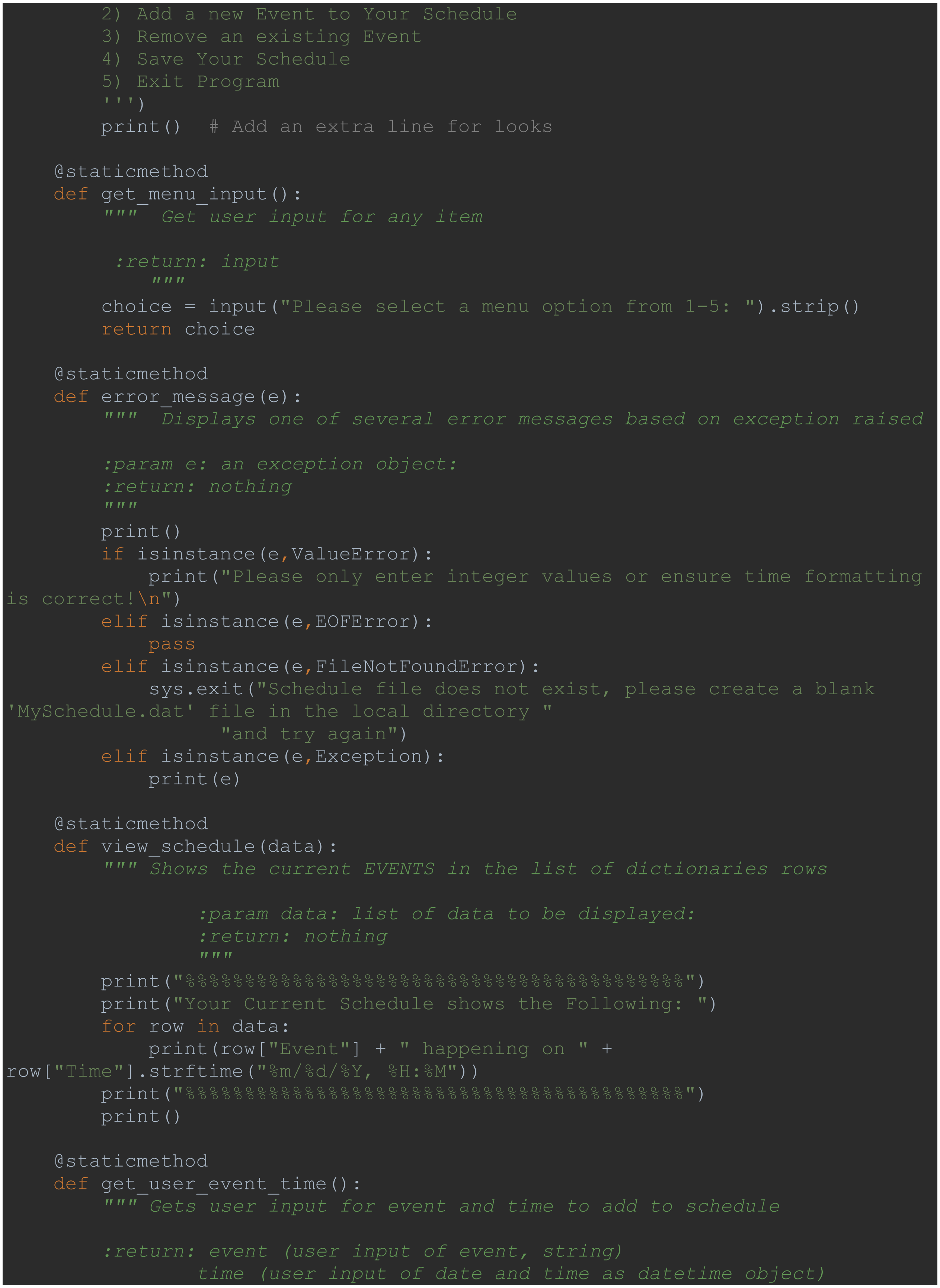
```
# ---------------------------------------------------------------------------
- #
# Title: Assignment 07 - Trying-Its-Best Scheduling Assistant
# Description: Simple bot that will assist in maintaining a schedule, pickled
in
#                a file named "MySchedule.dat", via user input;
#                the program utilizes custom error handling
# ChangeLog (Who,When,What):
# NSandhu,5.28.2022,Initialized code
# NSandhu,5.29.2022,Debugging
# ---------------------------------------------------------------------------
- #

# %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% DATA
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%#
import pickle
import sys
import datetime as dt
```



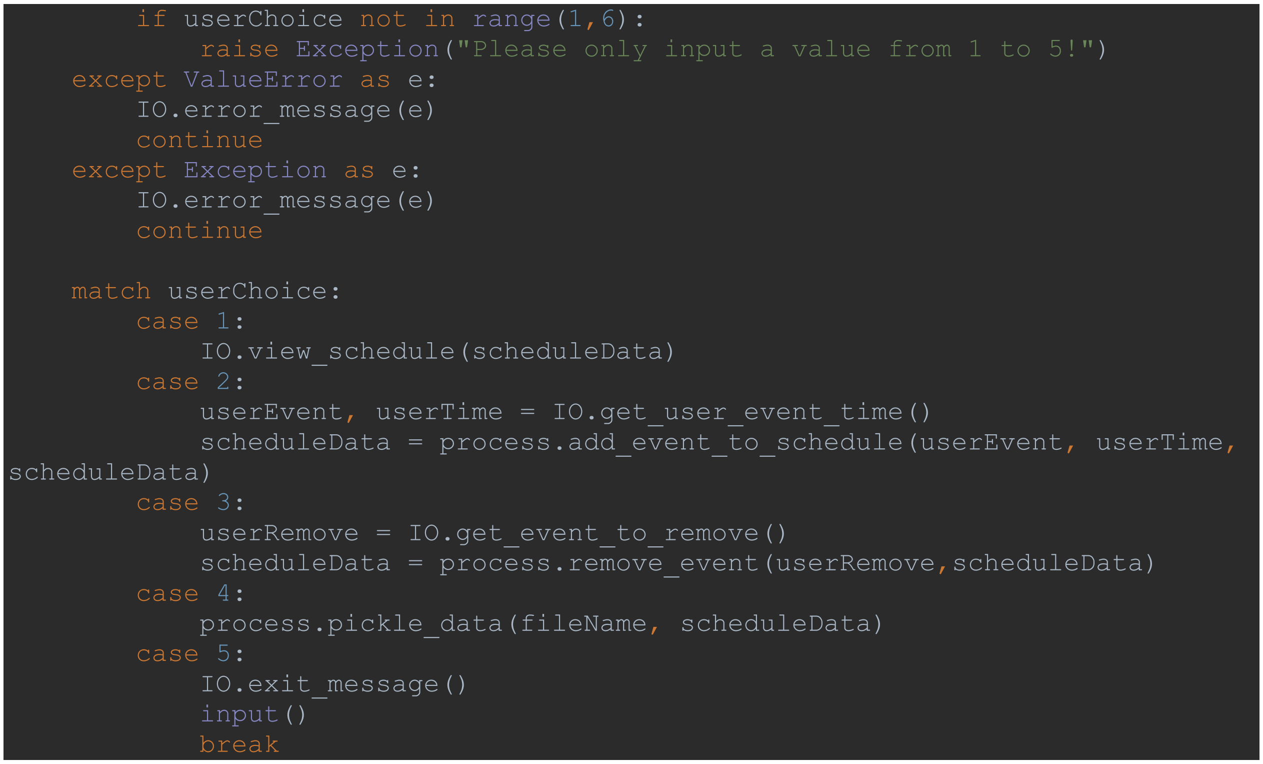
```
fileName = "MySchedule.dat"
scheduleData = []
userChoice = ""
userEvent = ""
userTime = None
userRemove = ""

# %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% PROCESSING
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%#
class process:
    """Processes data and information"""

    @staticmethod
    def read_pickled_data(file_name = "MySchedule.dat"):
        """ Reads in existing pickled data, else creates new pickle file

        :param file_name: file where stored schedule data is, default is
MySchedule.dat. Note that this file needs to
        exist prior to code execution:
        :return: data
        """
        data = []
        try:
            f = open(file_name,"rb")
            while True:
                try:
                    data = pickle.load(f)
                except EOFError as e:
                    IO.error_message(e)
                    break
        except FileNotFoundError as e:
            IO.error_message(e)
        f.close()
        return data

    @staticmethod
    def add_event_to_schedule(event, time, data):
        """ Adds data to a list of dictionary rows

        :param event: (string) with name of event:
        :param time: (datetime object) with time and date of event:
        :param scheduleDAta: (list) with dictionary rows for event and time
data:
        :return: scheduleData (list) of dictionary rows of data
        """
        row = {"Event": event, "Time": time}
        data.append(row)
        print("Event added to your schedule.")
        return data

    @staticmethod
    def remove_event(event, data):
        """ Removes data from a list of dictionary rows

        :param event: (string) with name of event to remove:
        :param data: (list) filled with schedule data:
        :return: (list) of dictionary rows of schedule data
```



```
        """
        i = 0
        flag = 0
        for row in data:
            if row["Event"].lower() == event.lower().strip():
                flag = 1
                i += 1
                data.remove(row)
                print("Event removed from your schedule.")
            else:
                i += 1
                if i == len(data) and flag == 0:
                    print("Event not found.")
                    print()  # print new line for looks
        return data

    @staticmethod
    def pickle_data(file_name = "MySchedule.dat", data = []):
        """ Writes data from a list of dictionary rows to a File

        :param file_name: (string) with name of file, default is
MySchedule.dat:
        :param data: (list) you want filled with file data, default is blank:
        :return: nothing
        """
        f = open(file_name, "ab")
        pickle.dump(data,f)
        f.close()
        print("Data saved!")
# %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% I/O
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%#

class IO:
    """ Performs I/O tasks """

    @staticmethod
    def welcome_message():
        """  Display a Welcome message to the user

        :return: nothing
        """

        print("""
        Welcome to the Scheduling Assistant! I will help you
        create and manage a basic schedule in the form of EVENTS
        and TIMES. Please choose from a menu option to get started:\n
        """)

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

        :return: nothing
        """
        print('''\n
        Menu of Options
        1) View current Schedule
```

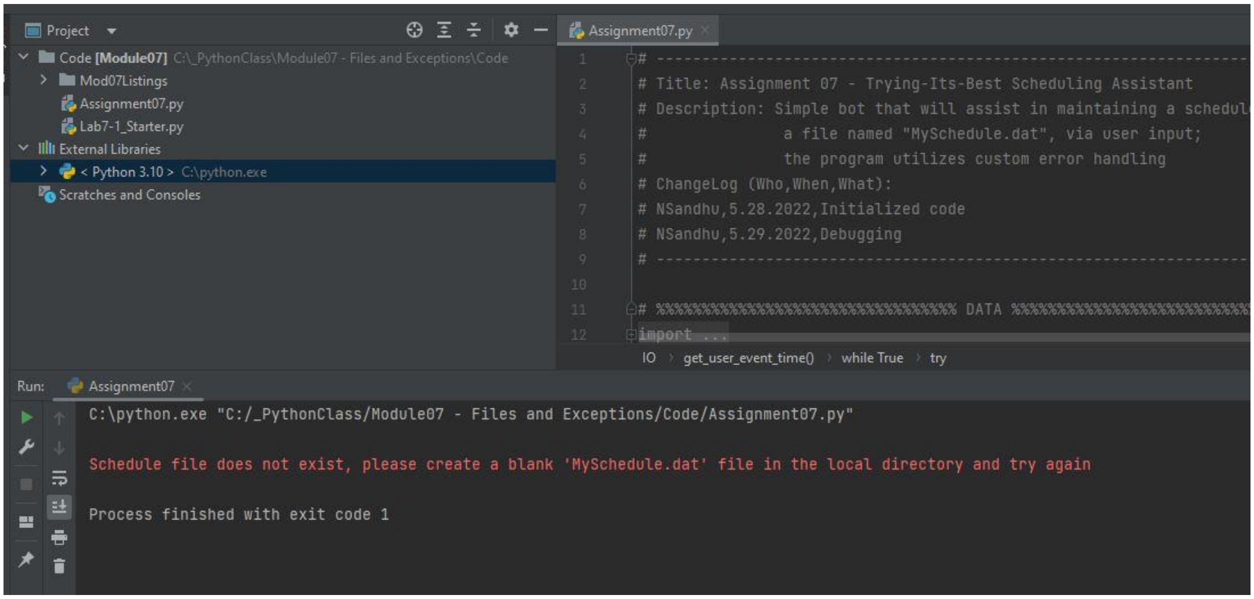


```
        2) Add a new Event to Your Schedule
        3) Remove an existing Event
        4) Save Your Schedule
        5) Exit Program
        ''')
        print()  # Add an extra line for looks

    @staticmethod
    def get_menu_input():
        """  Get user input for any item

         :return: input
            """
        choice = input("Please select a menu option from 1-5: ").strip()
        return choice

    @staticmethod
    def error_message(e):
        """  Displays one of several error messages based on exception raised

        :param e: an exception object:
        :return: nothing
        """
        print()
        if isinstance(e,ValueError):
            print("Please only enter integer values or ensure time formatting
is correct!\n")
        elif isinstance(e,EOFError):
            pass
        elif isinstance(e,FileNotFoundError):
            sys.exit("Schedule file does not exist, please create a blank
'MySchedule.dat' file in the local directory "
                  "and try again")
        elif isinstance(e,Exception):
            print(e)

    @staticmethod
    def view_schedule(data):
        """ Shows the current EVENTS in the list of dictionaries rows

                :param data: list of data to be displayed:
                :return: nothing
                """
        print("%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%")
        print("Your Current Schedule shows the Following: ")
        for row in data:
            print(row["Event"] + " happening on " +
row["Time"].strftime("%m/%d/%Y, %H:%M"))
        print("%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%")
        print()

    @staticmethod
    def get_user_event_time():
        """ Gets user input for event and time to add to schedule

        :return: event (user input of event, string)
                time (user input of date and time as datetime object)
        """
        event = input("Please input Event name: ")
        while True:
            try:
                timeMonth,timeDay,timeYear = input("Please enter date of
event in MM/DD/YYYY format: ").split(sep="/")
                timeHour, timeMin = input("Please enter time of Event in
HH:MM format (24 HOUR FORMAT): ").split(sep=":")
                timeDay = int(timeDay)
                timeMonth = int(timeMonth)
                timeYear = int(timeYear)
                timeHour = int(timeHour)
                timeMin = int(timeMin)
                if timeDay not in range(1,32) or timeMonth not in range(1,13)
or timeYear not in range(1,10000) or timeHour not in range(0,24) or timeMin
not in range(0,60):
                    print("One of the entered time parameters is out of
range, please try again.")
                    continue
                break
            except ValueError as e:
                IO.error_message(e)
                print("Please try again.")
                print()
        time = dt.datetime(year=timeYear, month=timeMonth, day=timeDay,
hour=timeHour, minute=timeMin,second=0)
        return event, time

    @staticmethod
    def get_event_to_remove():
        """  Gets the event name to be removed from the list

        :return: (string) with task
        """
        remove_event = input("Please enter name of Event to remove from list:
").strip()
        return remove_event

    @staticmethod
    def exit_message():
        """  Displays a message to the user prior to exiting program

        :return: nothing
        """
        print("Thank you! Program will end upon hitting 'Enter'...")

# %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% MAIN
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%#

scheduleData = process.read_pickled_data(fileName)

IO.welcome_message()

while True:
    IO.display_menu()
    try:
        userChoice = int(IO.get_menu_input())
```



```
        if userChoice not in range(1,6):
            raise Exception("Please only input a value from 1 to 5!")
    except ValueError as e:
        IO.error_message(e)
        continue
    except Exception as e:
        IO.error_message(e)
        continue

    match userChoice:
        case 1:
            IO.view_schedule(scheduleData)
        case 2:
            userEvent, userTime = IO.get_user_event_time()
            scheduleData = process.add_event_to_schedule(userEvent, userTime,
scheduleData)
        case 3:
            userRemove = IO.get_event_to_remove()
            scheduleData = process.remove_event(userRemove,scheduleData)
        case 4:
            process.pickle_data(fileName, scheduleData)
        case 5:
            IO.exit_message()
            input()
            break
```

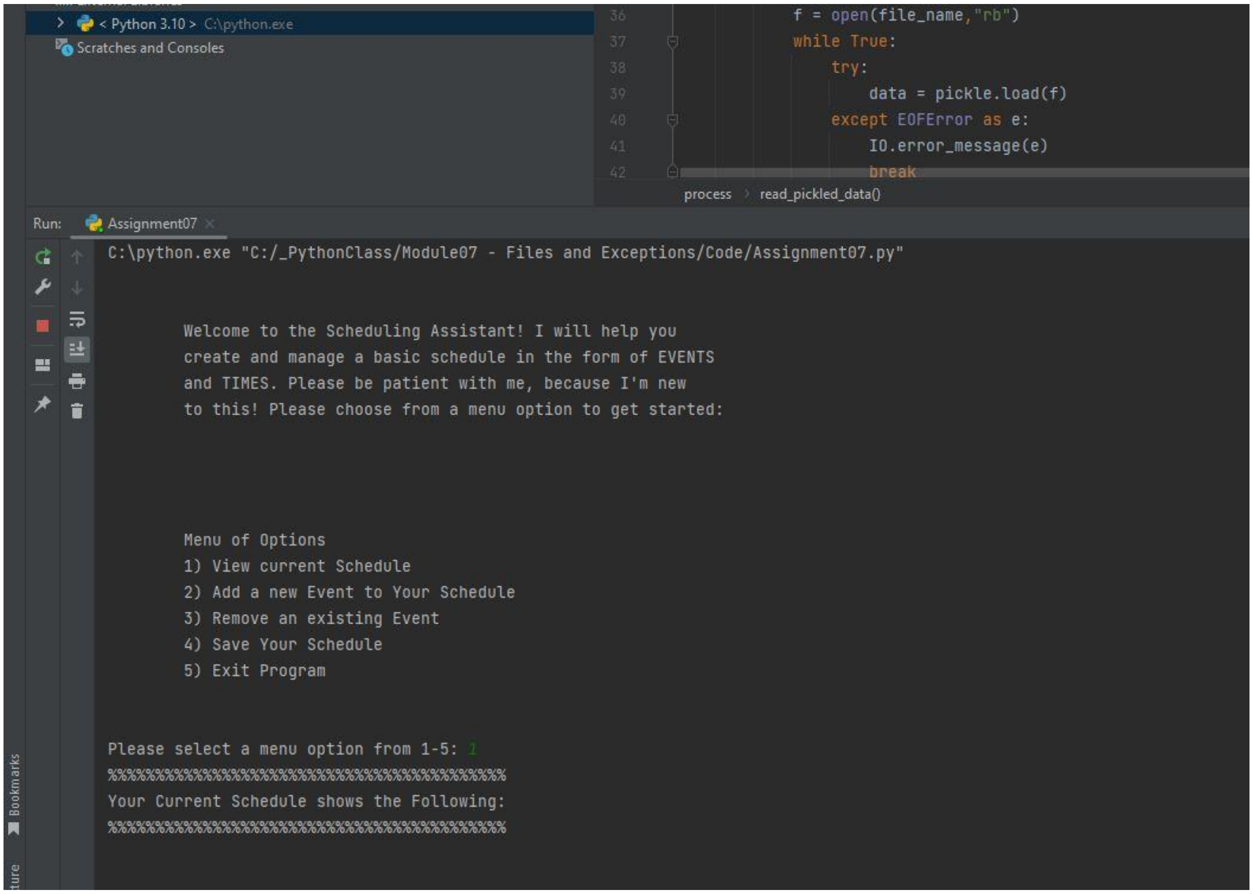
Fig. 1. Code written by N. Sandhu for creation of the scheduling assistant program.


Project
Code [Module07] C:_PythonClass\Module07 - Files and Exceptions\Code
Mod07Listings
Assignment07.py
Lab7-1_Starter.py
External Libraries
< Python 3.10 > C:\python.exe
Scratches and Consoles
Assignment07.py
IO › get_user_event_time() › while True › try
Run: Assignment07

```
# ---------------------------------------------------------------
# Title: Assignment 07 - Trying-Its-Best Scheduling Assistant
# Description: Simple bot that will assist in maintaining a schedul
#              a file named "MySchedule.dat", via user input;
#              the program utilizes custom error handling
# ChangeLog (Who,When,What):
# NSandhu,5.28.2022,Initialized code
# NSandhu,5.29.2022,Debugging
# ---------------------------------------------------------------

# %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% DATA %%%%%%%%%%%%%%%%%%%%%%%%%%%%
import ...
```

```
C:\python.exe "C:/_PythonClass/Module07 - Files and Exceptions/Code/Assignment07.py"

Schedule file does not exist, please create a blank 'MySchedule.dat' file in the local directory and try again

Process finished with exit code 1
```

Fig. 2. The code running in PyCharm, showing an error and exiting the program if the *MySchedule.dat* binary file is not found in the local directory.

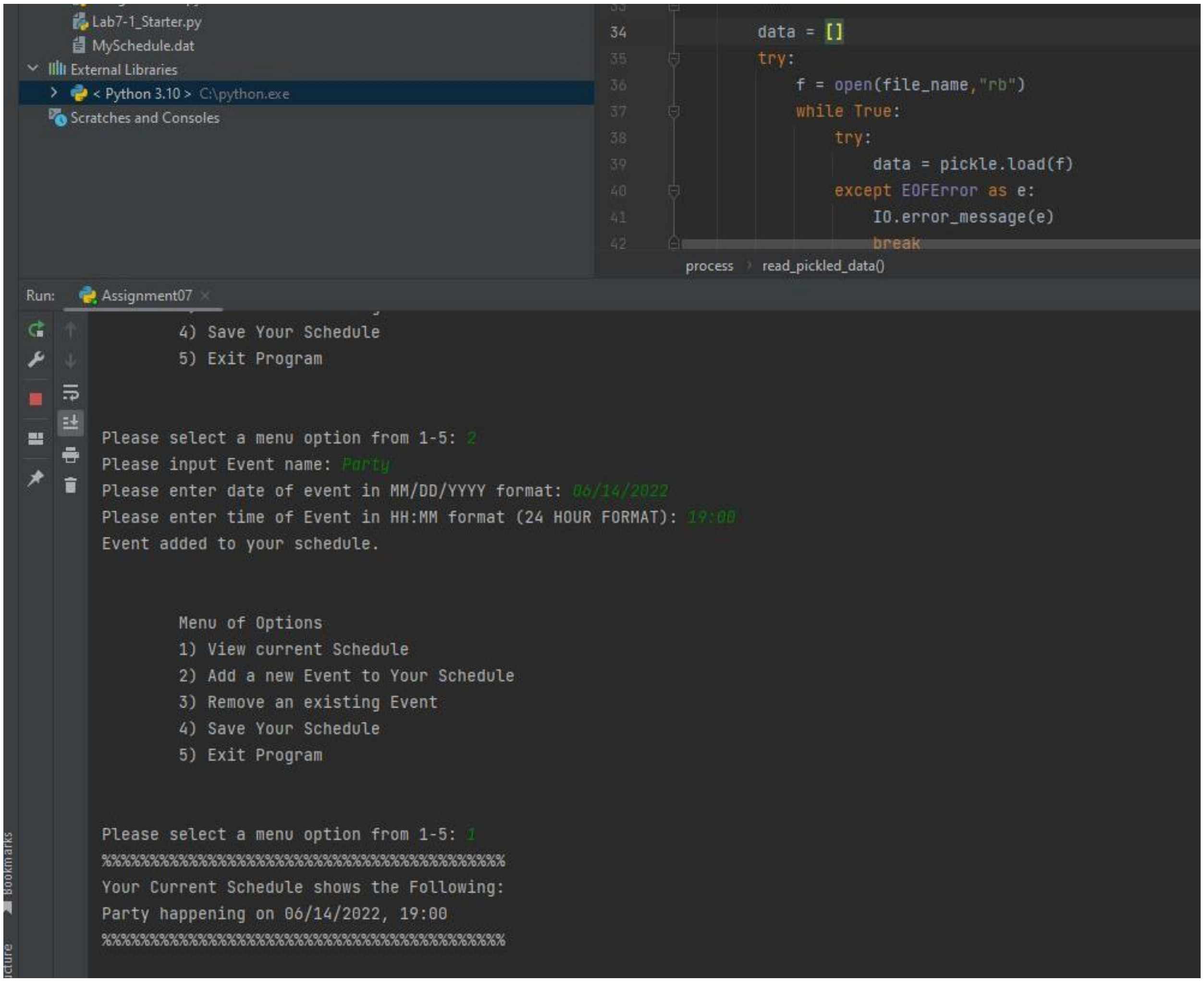


> < Python 3.10 > C:\python.exe
Scratches and Consoles
process › read_pickled_data()
Run: Assignment07 ×
Bookmarks

```
            f = open(file_name,"rb")
            while True:
                try:
                    data = pickle.load(f)
                except EOFError as e:
                    IO.error_message(e)
                    break
```

```
C:\python.exe "C:/_PythonClass/Module07 - Files and Exceptions/Code/Assignment07.py"


        Welcome to the Scheduling Assistant! I will help you
        create and manage a basic schedule in the form of EVENTS
        and TIMES. Please be patient with me, because I'm new
        to this! Please choose from a menu option to get started:




        Menu of Options
        1) View current Schedule
        2) Add a new Event to Your Schedule
        3) Remove an existing Event
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5: 1
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
Your Current Schedule shows the Following:
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

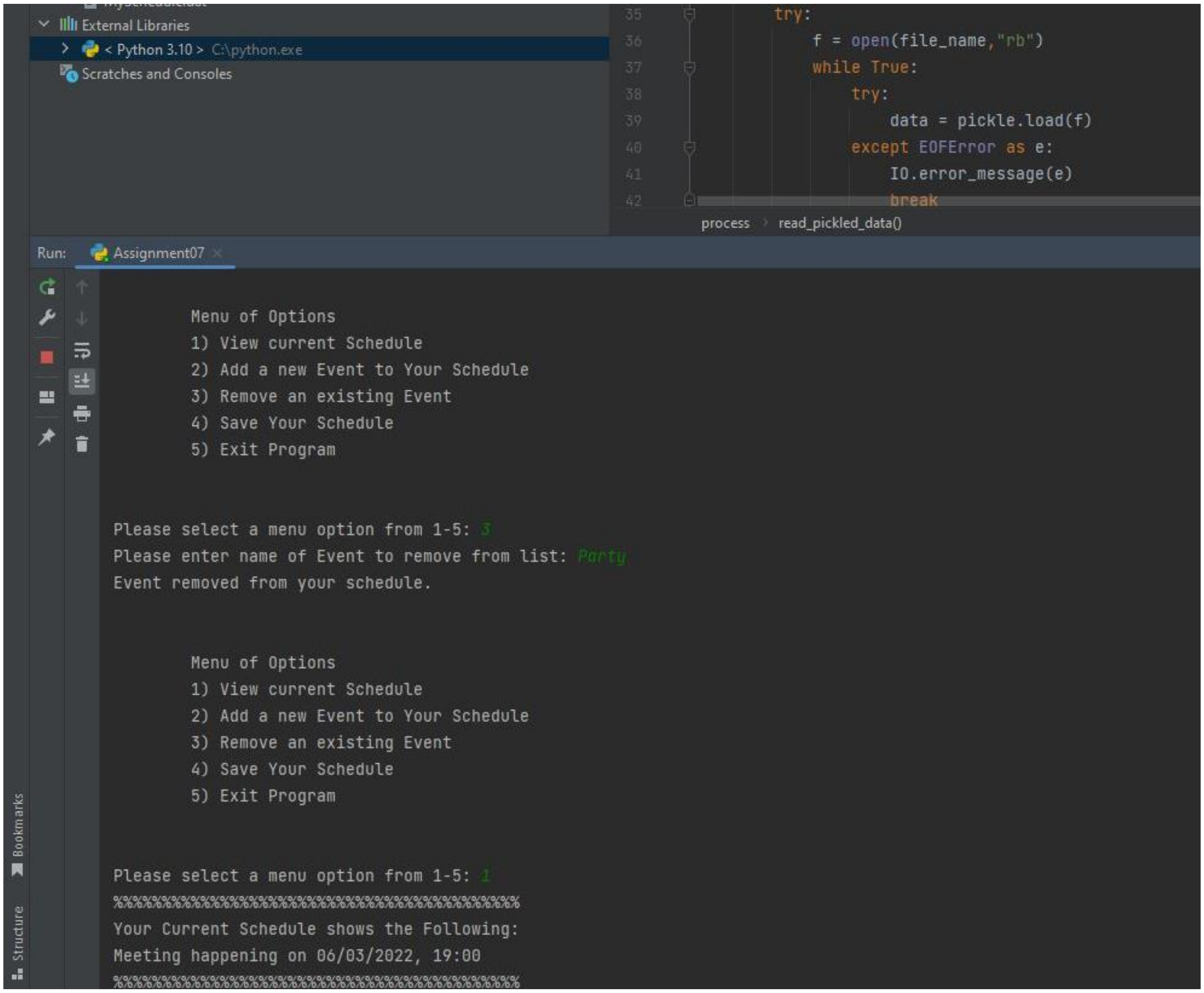
Fig. 3. The code running in PyCharm. Code start and an empty schedule are shown.



```python
        data = []
        try:
            f = open(file_name,"rb")
            while True:
                try:
                    data = pickle.load(f)
                except EOFError as e:
                    IO.error_message(e)
                    break
```

```
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5: 2
Please input Event name: Party
Please enter date of event in MM/DD/YYYY format: 06/14/2022
Please enter time of Event in HH:MM format (24 HOUR FORMAT): 19:00
Event added to your schedule.


        Menu of Options
        1) View current Schedule
        2) Add a new Event to Your Schedule
        3) Remove an existing Event
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5: 1
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
Your Current Schedule shows the Following:
Party happening on 06/14/2022, 19:00
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

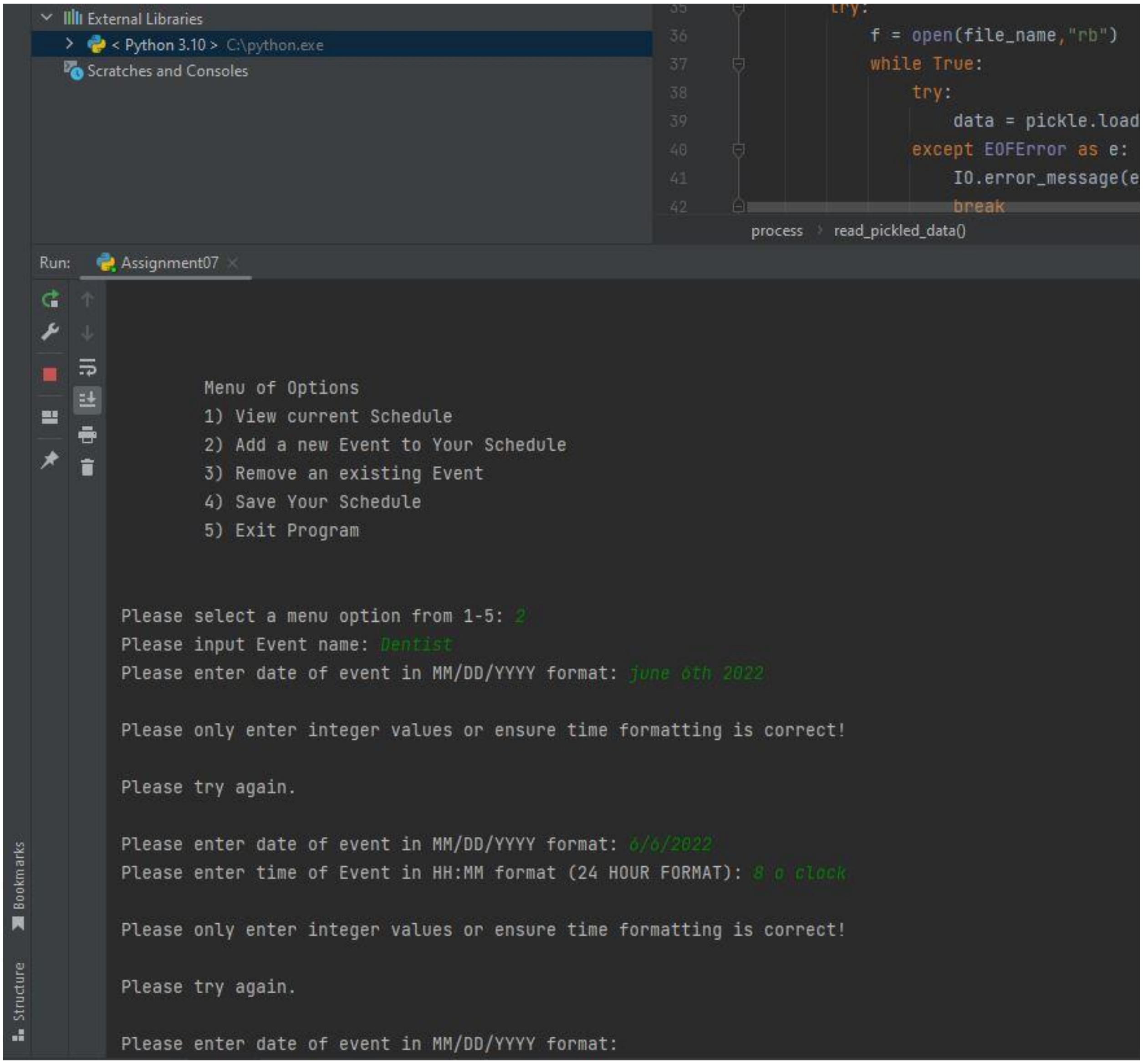
Fig. 4. The code running in PyCharm. An event is added to the schedule.



```
try:
    f = open(file_name,"rb")
    while True:
        try:
            data = pickle.load(f)
        except EOFError as e:
            IO.error_message(e)
            break
```

```

        Menu of Options
        1) View current Schedule
        2) Add a new Event to Your Schedule
        3) Remove an existing Event
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5: 3
Please enter name of Event to remove from list: Party
Event removed from your schedule.


        Menu of Options
        1) View current Schedule
        2) Add a new Event to Your Schedule
        3) Remove an existing Event
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5: 1
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
Your Current Schedule shows the Following:
Meeting happening on 06/03/2022, 19:00
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

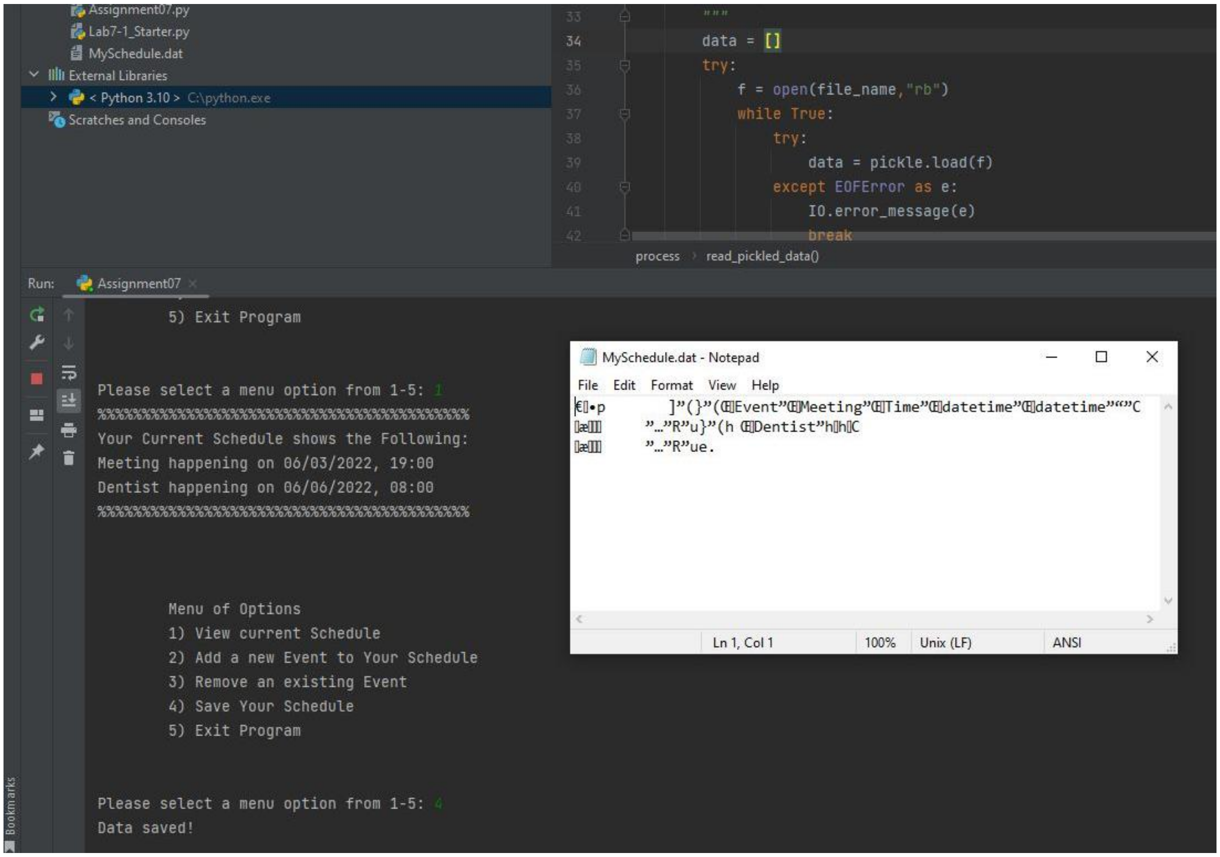
Fig. 5. The code running in PyCharm. An event is removed from the schedule.



```
        try:
            f = open(file_name,"rb")
            while True:
                try:
                    data = pickle.load
                except EOFError as e:
                    IO.error_message(e
                    break
```

```


        Menu of Options
        1) View current Schedule
        2) Add a new Event to Your Schedule
        3) Remove an existing Event
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5: 2
Please input Event name: Dentist
Please enter date of event in MM/DD/YYYY format: june 6th 2022

Please only enter integer values or ensure time formatting is correct!

Please try again.

Please enter date of event in MM/DD/YYYY format: 6/6/2022
Please enter time of Event in HH:MM format (24 HOUR FORMAT): 8 o clock

Please only enter integer values or ensure time formatting is correct!

Please try again.

Please enter date of event in MM/DD/YYYY format:
```

Fig. 6. The code running in PyCharm. A demonstration of structured error handling based on invalid user inputs for time.

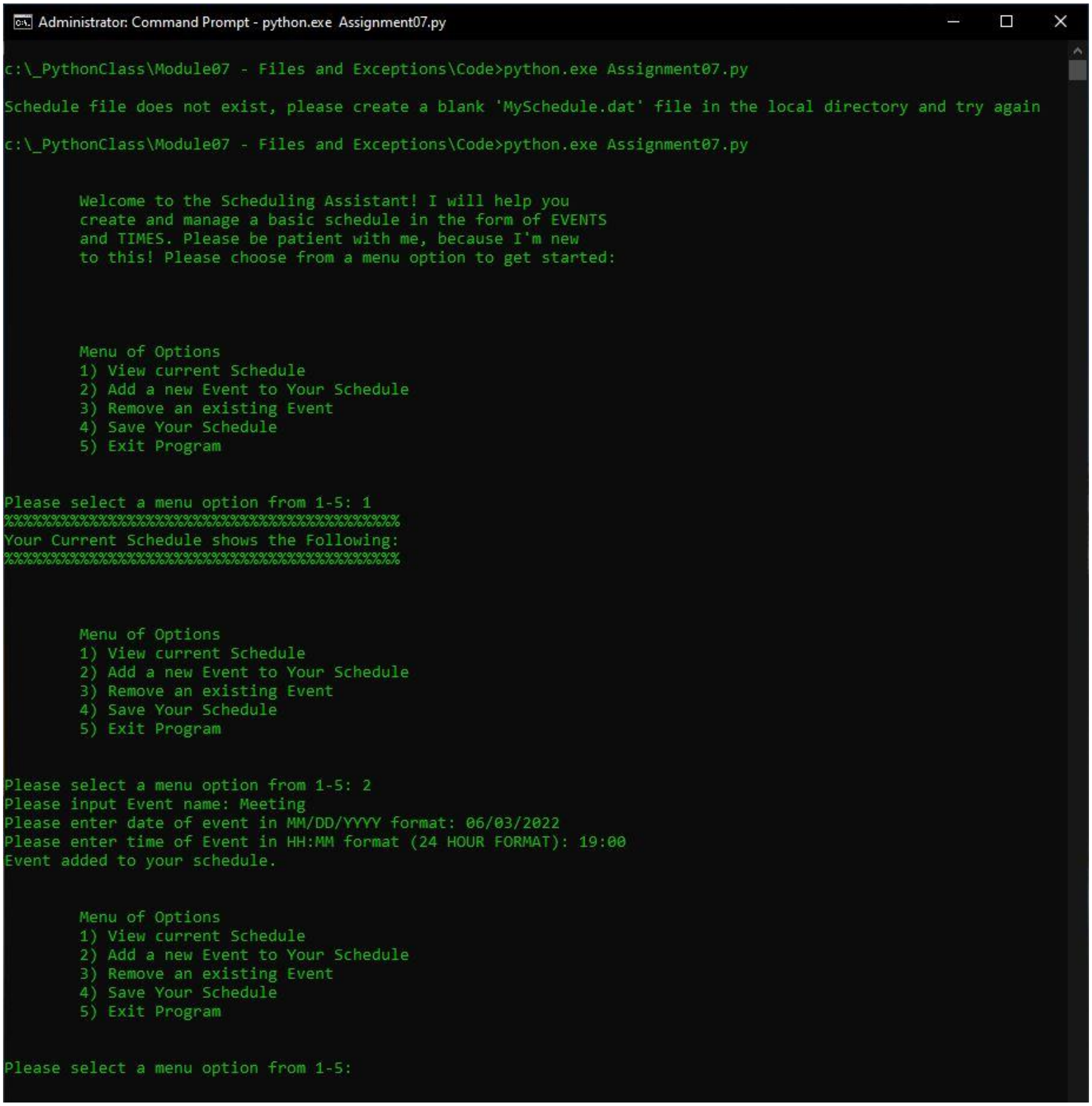


```
        """
        data = []
        try:
            f = open(file_name,"rb")
            while True:
                try:
                    data = pickle.load(f)
                except EOFError as e:
                    IO.error_message(e)
                    break
```

```
        5) Exit Program


Please select a menu option from 1-5: 1
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
Your Current Schedule shows the Following:
Meeting happening on 06/03/2022, 19:00
Dentist happening on 06/06/2022, 08:00
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%



        Menu of Options
        1) View current Schedule
        2) Add a new Event to Your Schedule
        3) Remove an existing Event
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5: 4
Data saved!
```

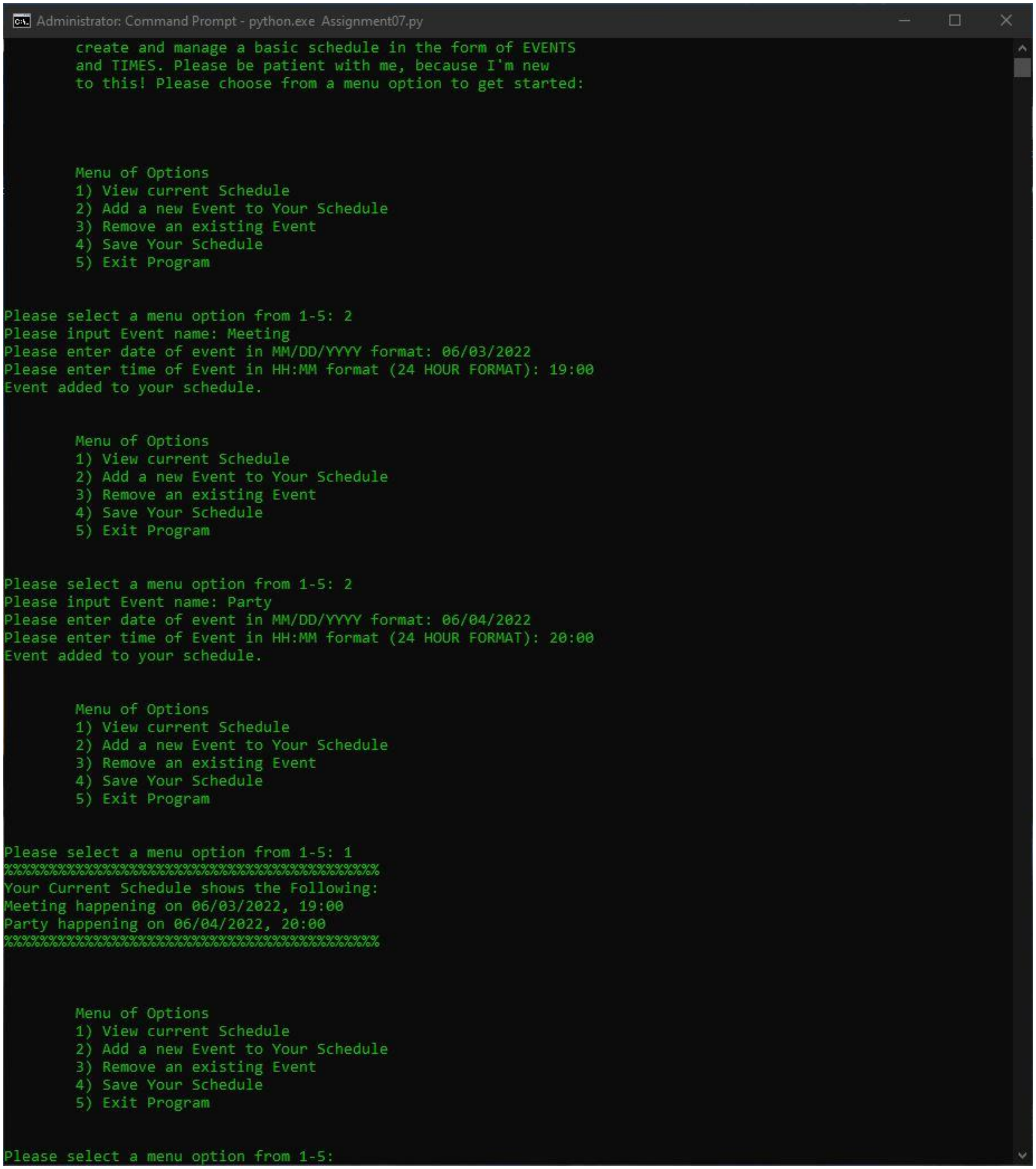
```
€□•p        ]”(}”(Œ□Event”Œ□Meeting”Œ□Time”Œ□datetime”Œ□datetime”“”C
□æ□□     ”…”R”u}”(h Œ□Dentist”h□h□C
□æ□□     ”…”R”ue.
```

Fig. 7. The code running in PyCharm. Data has been pickled and saved to the *MySchedule.dat* file, which is displayed in Notepad to show that it is in binary format.



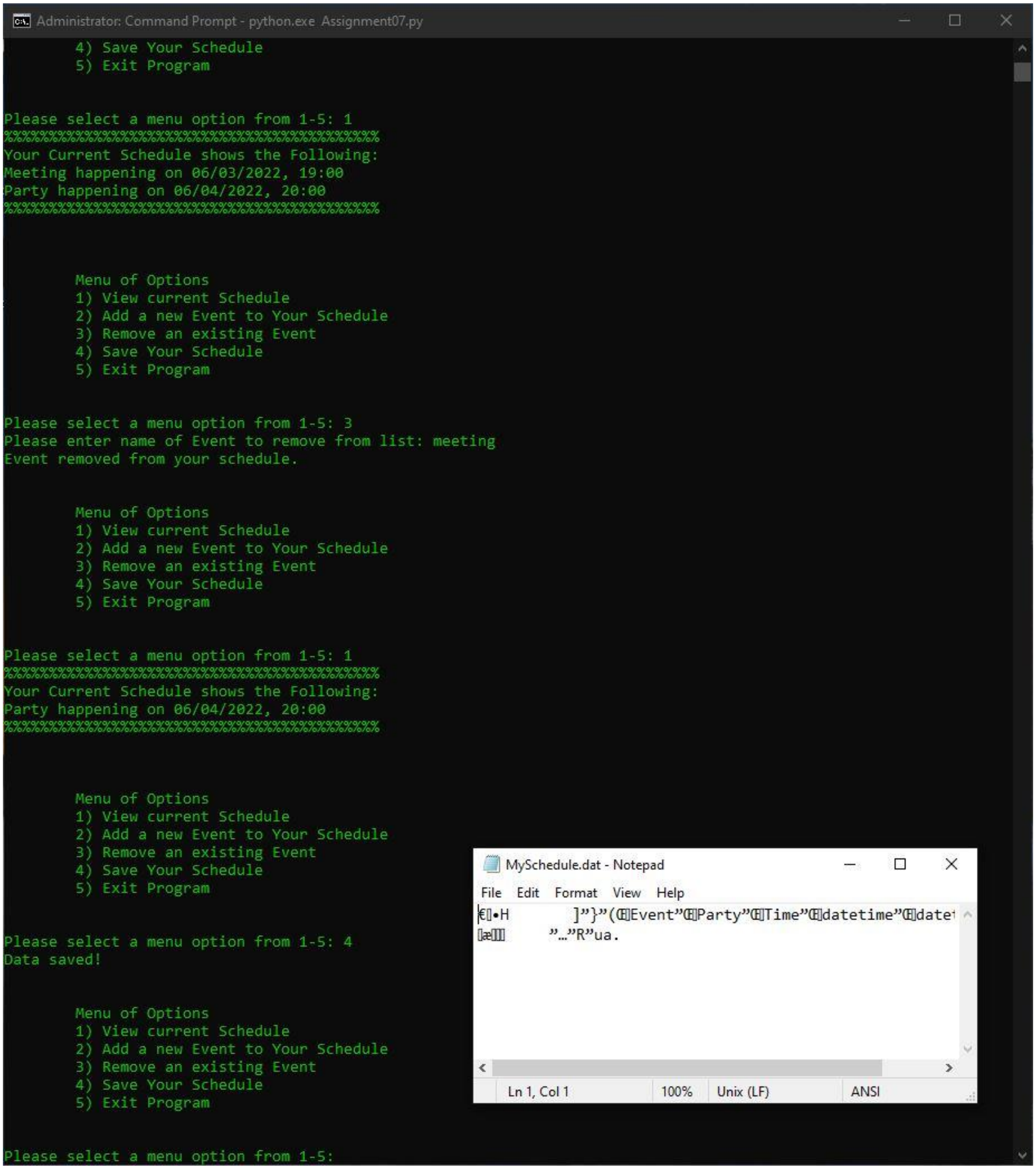
```
c:\_PythonClass\Module07 - Files and Exceptions\Code>python.exe Assignment07.py

Schedule file does not exist, please create a blank 'MySchedule.dat' file in the local directory and try again

c:\_PythonClass\Module07 - Files and Exceptions\Code>python.exe Assignment07.py


        Welcome to the Scheduling Assistant! I will help you
        create and manage a basic schedule in the form of EVENTS
        and TIMES. Please be patient with me, because I'm new
        to this! Please choose from a menu option to get started:




        Menu of Options
        1) View current Schedule
        2) Add a new Event to Your Schedule
        3) Remove an existing Event
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5: 1
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
Your Current Schedule shows the Following:
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%



        Menu of Options
        1) View current Schedule
        2) Add a new Event to Your Schedule
        3) Remove an existing Event
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5: 2
Please input Event name: Meeting
Please enter date of event in MM/DD/YYYY format: 06/03/2022
Please enter time of Event in HH:MM format (24 HOUR FORMAT): 19:00
Event added to your schedule.


        Menu of Options
        1) View current Schedule
        2) Add a new Event to Your Schedule
        3) Remove an existing Event
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5:
```

Fig. 8. The code running in the Windows Command Console. The results of not having a *MySchedule.dat* file, fixing this issue, and then showing an empty schedule.



```
        create and manage a basic schedule in the form of EVENTS
        and TIMES. Please be patient with me, because I'm new
        to this! Please choose from a menu option to get started:




        Menu of Options
        1) View current Schedule
        2) Add a new Event to Your Schedule
        3) Remove an existing Event
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5: 2
Please input Event name: Meeting
Please enter date of event in MM/DD/YYYY format: 06/03/2022
Please enter time of Event in HH:MM format (24 HOUR FORMAT): 19:00
Event added to your schedule.


        Menu of Options
        1) View current Schedule
        2) Add a new Event to Your Schedule
        3) Remove an existing Event
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5: 2
Please input Event name: Party
Please enter date of event in MM/DD/YYYY format: 06/04/2022
Please enter time of Event in HH:MM format (24 HOUR FORMAT): 20:00
Event added to your schedule.


        Menu of Options
        1) View current Schedule
        2) Add a new Event to Your Schedule
        3) Remove an existing Event
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5: 1
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
Your Current Schedule shows the Following:
Meeting happening on 06/03/2022, 19:00
Party happening on 06/04/2022, 20:00
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%



        Menu of Options
        1) View current Schedule
        2) Add a new Event to Your Schedule
        3) Remove an existing Event
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5:
```

Fig. 9. The code running in the Windows Command Console. Events and times are added to the schedule.



```
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5: 1
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
Your Current Schedule shows the Following:
Meeting happening on 06/03/2022, 19:00
Party happening on 06/04/2022, 20:00
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%



        Menu of Options
        1) View current Schedule
        2) Add a new Event to Your Schedule
        3) Remove an existing Event
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5: 3
Please enter name of Event to remove from list: meeting
Event removed from your schedule.


        Menu of Options
        1) View current Schedule
        2) Add a new Event to Your Schedule
        3) Remove an existing Event
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5: 1
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
Your Current Schedule shows the Following:
Party happening on 06/04/2022, 20:00
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%



        Menu of Options
        1) View current Schedule
        2) Add a new Event to Your Schedule
        3) Remove an existing Event
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5: 4
Data saved!


        Menu of Options
        1) View current Schedule
        2) Add a new Event to Your Schedule
        3) Remove an existing Event
        4) Save Your Schedule
        5) Exit Program


Please select a menu option from 1-5:
```

```
€□•H        ]”}”(Œ□Event”Œ□Party”Œ□Time”Œ□datetime”Œ□date
□æ□□□     ”…”R”ua.
```

Fig. 10. The code running in the Windows Command Console. An event is removed, data is pickled and saved, and the resulting binary file is shown.