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Foundations of Programming (Python)

Assignment 05

# Handling Collections of Data with Python

## Part 2

### Introduction

In this document, I will provide an overview of using multidimensional data constructs. Specifically, this report will highlight loops, strings, lists, dictionaries, and associated methods. This report will include discussion of the CDInventory.py script and what challenges I came across.

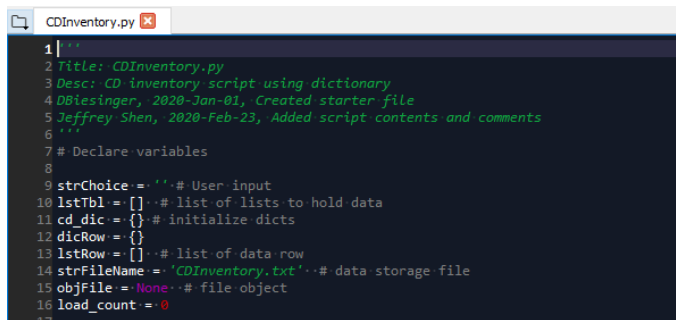
### CD Inventory Script

For this assignment, I created a python script that will manage a CD inventory based on user input. This assignment added new functionality from last weeks, specifically using dictionaries, loading existing data, and deleting data. The initial pseudocode was provided by the instructor. The menu and structure of the code is as follows:

```
[l] load Inventory from file  
[a] Add CD  
[i] Display Current Inventory  
[d] delete CD from Inventory  
[s] Save Inventory to file  
[x] exit
```

```
if strChoice == 'x'  
    do this  
if strChoice == 'l'  
    do this  
if strChoice == 'a'  
    do this  
if strChoice == 'i'  
    do this  
if strChoice == 'd'  
    do this  
if strChoice == 's'  
    do this
```

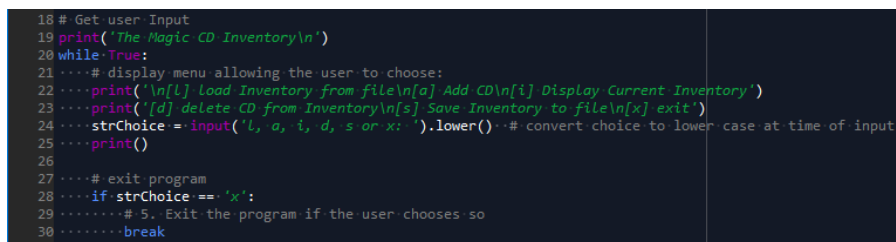
In the beginning of the script, I initialize the variables needed. The most important note here creating `cd_dic = {}`, as this is the dictionary we will be using to store our data in.



```
1|'''
2|Title: CDInventory.py
3|Desc: CD inventory script using dictionary
4|DBiesinger, 2020-Jan-01, Created starter file
5|Jeffrey Shen, 2020-Feb-23, Added script contents and comments
6|'''
7|# Declare variables
8|
9|strChoice = '' # User input
10|lstTbl = [] # list of lists to hold data
11|cd_dic = {} # initialize dicts
12|dicRow = {}
13|lstRow = [] # list of data row
14|strFileName = 'CDInventory.txt' # data storage file
15|objFile = None # file object
16|load_count = 0
17|
```

Figure 1 Initialize Variables

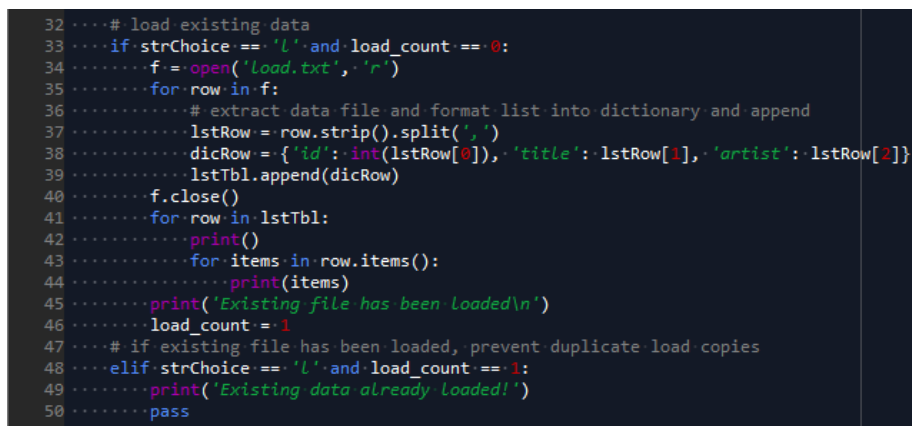
Following initializing, the script outlines the while loop that will continue to ask user input. The menu is printed and the `strChoice` checks if “x” is inputted. This will exit the program.



```
18# Get user Input
19print('The Magic CD Inventory\n')
20while True:
21    ...# display menu allowing the user to choose:
22    ...print('\n[l] Load Inventory from file\n[a] Add CD\n[i] Display Current Inventory')
23    ...print('[d] delete CD from Inventory\n[s] Save Inventory to file\n[x] exit')
24    ...strChoice = input('l, a, i, d, s or x: ').lower() # convert choice to lower case at time of input
25    ...print()
26
27    ...# exit program
28    ...if strChoice == 'x':
29        ...# 5. Exit the program if the user chooses so
30        ...break
31
```

Figure 2 Menu Options

The new functionality of this script is to load existing data. I chose to extract data from a “load.txt” file which is shown in line 34. The data is extracted in a for loop, taken into a list, then placed into a dictionary with associated key/values. The dictionary is appended to the 2d-list. I included a print to show what data was loaded from the text file. I included an extra elif condition so that if the user loads the data, and selects “l” from the menu again, there will not be duplicate loads. I check this by creating a `load_count` variable.



```
32...# load existing data
33...if strChoice == 'l' and load_count == 0:
34    ...f = open('Load.txt', 'r')
35    ...for row in f:
36        ...# extract data file and format list into dictionary and append
37        ...lstRow = row.strip().split(',')
38        ...dicRow = {'id': int(lstRow[0]), 'title': lstRow[1], 'artist': lstRow[2]}
39        ...lstTbl.append(dicRow)
40    ...f.close()
41    ...for row in lstTbl:
42        ...print()
43    ...for items in row.items():
44        ...print(items)
45    ...print('Existing file has been loaded\n')
46    ...load_count = 1
47    ...# if existing file has been loaded, prevent duplicate load copies
48    ...elif strChoice == 'l' and load_count == 1:
49        ...print('Existing data already loaded!')
50        ...pass
51
```

Figure 3 Load Data

To user input data, we need to assign which associated key and value pairs. This is represented in line 55 to 57. The user data is appended to the 2d-list.

```
51 ....# adding additional user input data
52 ....elif strChoice == 'a':..# no elif necessary, as this code is only reached if strChoice is not 'exit'
53 ....# add data to the table (2d-list) each time the user wants to add data
54 .....cd_dic['id'] = int(input('Enter an ID: '))
55 .....cd_dic['title'] = input('Enter the title: ')
56 .....cd_dic['artist'] = input('Enter the artist: ')
57 .....# Python does not implicitly copy objects so create a copy of the dic
58 .....lstTbl.append(cd_dic.copy())
59 .....
60 .....
```

Figure 4 Add Data

To display the current inventory, I iterate using a nested for loop. This is needed since the collection of data is stored as a list of dictionaries. [{dataset1}, {dataset2}, etc.]

```
61 ....# display current CD inventory
62 ....elif strChoice == 'i':
63 .....# display the current data to the user each time the user wants to display the data
64 .....print('Current CD Inventory')
65 .....print('ID, CD Title, Artist')
66 .....# iterate using nested for loop
67 .....for row in lstTbl:
68 .....    print()
69 .....    for v in row.values():
70 .....        print(v, end = '\t')
71 .....
```

Figure 5 Display Data

To delete an entry, the user is shown what is currently listed in the inventory. Their input is stored as a variable “choice” and then the entry is deleted. I used the pop method to delete a user’s choice.

```
72 ....# delete an entry in CD inventory
73 ....elif strChoice == 'd':
74 .....for row in lstTbl:
75 .....    print()
76 .....    for v in row.values():
77 .....        print(v, end = '\t')
78 .....    choice = int(input('Delete ID: '))-1
79 .....    # print delete confirmation
80 .....    print('Deleted following: ', lstTbl.pop(choice))
81 .....    pass
82 .....
```

Figure 6 Delete Data

To save the CD inventory to a text file, I open the file in line 86. Then, a for loop iterates through the values and saves it using file comprehension. I wanted to only save only values of the dictionary. The file is closed once write operations are completed. In line 101 and 102, if a user does not select one of the menu options, they are prompted to choose again.

```

83 ....# Saving CD inventory to text file
84 ....elif strChoice == 's':
85 ....    # iterate through table values and save to text file name
86 ....    with open('CDInventory.txt', 'a') as f:
87 ....        for row in lstTbl:
88 ....            txt_line = ", ".join([str(value) for value in row.values()]) + '\n'
89 ....            f.write(txt_line)
90 ....        f.close()
91 # modified code to support using dictionaries instead of lists
92 # ..... objFile = open('CDInventory.txt', 'a')
93 # ..... for row in lstTbl:
94 # .....     strRow = ''
95 # .....     for item in row:
96 # .....         strRow += str(item) + ','
97 # .....     strRow = strRow[:-1] + '\n'
98 # .....     objFile.write(strRow)
99 # .....     objFile.close()
100 .....print('CD Inventory saved')
101 .....else:
102 .....    print('Please choose either l, a, i, d, s or x!')

```

Figure 7 Save Data

In the appendix, an example scenario of the script is shown, depicting each of the menu operations (both in Spyder and in the Terminal).

## Questions

- What is the difference between a Dictionary and a List?
  - Dictionaries are mapping types and hold key-value pairs.
- What is the difference between an index and a key?
  - Values are stored under keys, whereas index just associate where the value may be stored in an array. For example, [{key1: value1}, {key2: value2}] vs [value1, value2]
- How do you read data from a file into a list?
  - Reading data from a file into a list can be done by using file read ('r') and string.strip() & string.split() methods.
- How do you read data from a file into a dictionary?
  - Reading data from a file into a dictionary can be done by reading the data into its associated key-value pair: dicRead = {'key1': value[index], 'key2': value[index]}
- Why is it making sense to organize data in a 2-dimensional way?
  - All relevant data and entry data is grouped together. It is easier to read and when the data is formatted in this way.
- What is the programming pattern "Separation of Concerns"?
  - Using a template of data, processing and presentation (input/output) for your code.
- How would you use a function to organize your code?
  - A function can be used to determine what the user input selection was and then process the data accordingly.
- Why is a script template useful?

- Templates can save time by auto populating the editor with user preferences.
- Why is error handling (try-except) useful?
  - The error can be shown to the user so that they can understand the problem and keep the code running.
- What is GitHub and why is it used?
  - GitHub provides software development version control and is an environment where programmers alike can collaborate/share throughout the community
- What is GitHub's mascot?
  - Octocat

## Summary

In this lab, I explored using dictionaries for CDInventory.py script. It was helpful to build upon the knowledge learned using lists and extend using dictionaries<sup>1</sup>. Some new functionalities were introduced which meant the existing code needed to be modified to accommodate. One particular challenge I faced was understanding how to manipulate key-value pairs, which is the basis of using dictionaries<sup>2</sup>. I think the code can be further improved to make sure all user input scenarios are accounted for (e.g. saving data). The code was also uploaded to GitHub<sup>3</sup>.

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<sup>1</sup> [https://www.tutorialspoint.com/python/python\\_dictionary.htm](https://www.tutorialspoint.com/python/python_dictionary.htm)

<sup>2</sup> <https://realpython.com/iterate-through-dictionary-python/#iterating-through-values>

<sup>3</sup> [https://github.com/jrshen18/Assignment\\_05](https://github.com/jrshen18/Assignment_05)

# Appendix

## Complete Code for AddressBook.py

```
1 |  
2 |title: CDInventory.py  
3 |desc: CD inventory script using dictionary  
4 |DBlesinger, 2020-Jan-01, Created starter file  
5 |Jeffrey Shen, 2020-Feb-23, Added script contents and comments  
6 |  
7 |# Declare variables  
8 |  
9 |strChoice = '' # User input  
10 |lstTbl = [] # list of lists to hold data  
11 |cd_dic = {} # initialize dicts  
12 |dicRow = {}  
13 |lstRow = [] # list of data row  
14 |strFileIname = 'CDInventory.txt' # data storage file  
15 |objFile = None # file object  
16 |load_count = 0  
17 |  
18 |# Get user input  
19 |print('The Magic CD Inventory\n')  
20 |while True:  
21 |    # display menu allowing the user to choose:  
22 |    print('\n[1] Load Inventory from file\n[a] Add CD\n[i] Display Current Inventory')  
23 |    print('[d] delete CD from inventory\n[s] save inventory to file\n[x] exit')  
24 |    strChoice = input('l, a, i, d, s or x: ').lower() # convert choice to lower case at time of input  
25 |    print()  
26 |  
27 |    # exit program  
28 |    if strChoice == 'x':  
29 |        # S. Exit the program if the user chooses so  
30 |        break  
31 |  
32 |    # load existing data  
33 |    if strChoice == 'l' and load_count == 0:  
34 |        f = open('load.txt', 'r')  
35 |        for row in f:  
36 |            # extract data file and format list into dictionary and append  
37 |            lstRow = row.strip().split(',')  
38 |            dicRow = {'id': int(lstRow[0]), 'title': lstRow[1], 'artist': lstRow[2]}  
39 |            lstTbl.append(dicRow)  
40 |            f.close()  
41 |        for row in lstTbl:  
42 |            print()  
43 |            for items in row.items():  
44 |                print(items)  
45 |            print('Existing file has been loaded\n')  
46 |            load_count = 1  
47 |        # if existing file has been loaded, prevent duplicate load copies  
48 |        elif strChoice == 'l' and load_count == 1:  
49 |            print('Existing data already loaded!')  
50 |            pass  
51 |  
52 |    # adding additional user input data  
53 |    elif strChoice == 'a': # no elif necessary, as this code is only reached if strChoice is not 'exit'  
54 |        # add data to the table (2d-list) each time the user wants to add data  
55 |        cd_dic['id'] = int(input('Enter an ID: '))  
56 |        cd_dic['title'] = input('Enter the title: ')  
57 |        cd_dic['artist'] = input('Enter the artist: ')  
58 |        # Python does not implicitly copy objects so create a copy of the dic  
59 |        lstTbl.append(cd_dic.copy())  
60 |  
61 |    # display current CD inventory  
62 |    elif strChoice == 'i':  
63 |        # display the current data to the user each time the user wants to display the data  
64 |        print('Current CD Inventory')  
65 |        print('ID, CD Title, Artist')  
66 |        # iterate using nested for loop  
67 |        for row in lstTbl:  
68 |            print()  
69 |            for v in row.values():  
70 |                print(v, end = '/t')  
71 |  
72 |    # delete an entry in CD inventory  
73 |    elif strChoice == 'd':  
74 |        for row in lstTbl:  
75 |            print()  
76 |            for v in row.values():  
77 |                print(v, end = '/t')  
78 |            choice = int(input('Delete ID: '))-1  
79 |            # print delete confirmation  
80 |            print('Deleted following: ', lstTbl.pop(choice))  
81 |            pass  
82 |  
83 |    # Saving CD inventory to text file  
84 |    elif strChoice == 's':  
85 |        # iterate through table values and save to text file name  
86 |        with open('CDInventory.txt', 'a') as f:  
87 |            for row in lstTbl:  
88 |                txt_line = ', '.join([str(value) for value in row.values()]) + '\n'  
89 |                f.write(txt_line)  
90 |            f.close()  
91 |    # modified code to support using dictionaries instead of lists  
92 |    objFile = open('CDInventory.txt', 'a')  
93 |    for row in lstTbl:  
94 |        strRow = ''  
95 |        for item in row:  
96 |            strRow += str(item) + ', '  
97 |        strRow = strRow[:-1] + '\n'  
98 |        objFile.write(strRow)  
99 |    objFile.close()  
100 |    print('CD Inventory saved')  
101 |    else:  
102 |        print('Please choose either l, a, i, d, s or x!')
```

## Example Run from Spyder

```
In [48]: runfile('C:/Python/Assignment05/CDInventory.py', wdir='C:/Python/Assignment05')
The Magic CD Inventory

[1] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit

1, a, i, d, s or x: 1

('id', 1)
('title', ' The Search')
('artist', ' AJR')

('id', 2)
('title', ' Paralyzed')
('artist', ' NF')

('id', 3)
('title', ' Everything')
('artist', ' Michael Buble')
Existing file has been loaded

[1] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit

1, a, i, d, s or x: a

Enter an ID: 4

Enter the title: Sunshine

Enter the artist: Atmosphere
```

```
[1] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit

1, a, i, d, s or x: i

Current CD Inventory
ID, CD Title, Artist

1|      The Search|    AJR|
2|      Paralyzed|    NF|
3|      Everything| Michael Buble|
4|      Sunshine|  Atmosphere|
[1] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit

1, a, i, d, s or x: d

1|      The Search|    AJR|
2|      Paralyzed|    NF|
3|      Everything| Michael Buble|
4|      Sunshine|  Atmosphere|
Delete ID: 1
Deleted following: {'id': 1, 'title': ' The Search', 'artist': ' AJR'}

[1] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit
```

```
1, a, i, d, s or x: i

Current CD Inventory
ID, CD Title, Artist

2|      Paralyzed|      NF|
3|      Everything|    Michael Buble|
4|      Sunshine|    Atmosphere|
[l] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit

1, a, i, d, s or x: s

CD Inventory saved

[l] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit

1, a, i, d, s or x: x

In [42]:
```



CDInventory - Notepad

File Edit Format View Help

```
2, Paralyzed, NF
3, Everything, Michael Buble
4, Sunshine, Atmosphere|
```



## Example Run from Terminal

```
Anaconda Powershell Prompt (Anaconda3)

[l] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit
l, a, i, d, s or x: l

('id', 1)
('title', ' The Search')
('artist', ' AJR')

('id', 2)
('title', ' Paralyzed')
('artist', ' NF')

('id', 3)
('title', ' Everything')
('artist', ' Michael Buble')
Existing file has been loaded

[l] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit
l, a, i, d, s or x: a

Enter an ID: 4
Enter the title: Shine
Enter the artist: Yael

[l] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit
l, a, i, d, s or x: a

Enter an ID: 5
Enter the title: Tangerine
Enter the artist: Hot Chelle Rae

[l] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit
l, a, i, d, s or x: d

1|      The Search|      AJR|
2|      Paralyzed|      NF|
3|      Everything| Michael Buble|
4|      Shine| Yael|
5|      Tangerine| Hot Chelle Rae| Delete ID: 5
Deleted following: {'id': 5, 'title': 'Tangerine', 'artist': 'Hot Chelle Rae'}
```

```

[l] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit
l, a, i, d, s or x: i

Current CD Inventory
ID, CD Title, Artist

1|      The Search|      AJR|
2|      Paralyzed|      NF|
3|      Everything|  Michael Buble|
4|      Shine|    Yael|
[l] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit
l, a, i, d, s or x: s

CD Inventory saved

[l] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit
l, a, i, d, s or x: x

(base) PS C:\_Python\Assignment05>

```

```

2, Paralyzed, NF
3, Everything, Michael Buble
4, Shine, Yael

```