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Discussion 6: Midterm Review and CSV

SI 206: Data-Oriented Programming

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School of Information University of Michigan

Fall 2023



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Practice

Reminders

- Midterm 1 during lecture time (Wed/Thur) in the lecture room
- Can bring one double-side cheat sheet with notes
- No outside resource (Google, ChatGPT, GitHub Copilot, Runestone...)

Deadlines

- Nothing due this Friday
- Project 1 due next Friday (10/13)

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Practice Problem Defined with the keyword def

Must be called to execute

Function

```
def print_list(my_list):
    for elm in my_list:
    print(elm)

print_list([1, 2, 3])
```

Conditional



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Practice Problem • Execute code if a Boolean expression is true or false

Keywords: if, elif, else

Logical operators: not, and, or.

Conditionals

```
1 score = 100
2 if 95 <= score <= 100:
3    print('A+')
4 elif score >= 60:
5    print('Pass')
6 else:
7    print('Fail')
```

String



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Practice Problem String methods:

- str.lower(): converts all uppercase characters in a string into lowercase characters and returns it.
- str.upper(): converts all lowercase characters in a string into uppercase characters and returns it.
- str.capitalize(): converts the first character of a string to an uppercase letter and all other alphabets to lowercase.
- str.startswith(prefix): returns True if a string starts with the specified prefix. If not, it returns False
- str.find(sub_str): returns the index of first occurrence of the substring (if found). If not found, it returns -1.
- String indexing and slicing

String



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Assume my_string = 'i love PYTHON'

```
String
```

```
my_string.lower()  # return 'i love python'
my_string.upper()  # return 'I LOVE PYTHON'
my_string.capitalize()  # return 'I love python'
my_string.find('ov')  # return 3
my_string[2]  # return 'l'
my_string[-5:-3]  # return 'YT'
```

List



List

List holds items in order

List methods:

• list.append(item): adds an item to the end of the list.

• list.extend(list_2): adds all the elements of an iterable (list, tuple, string etc.) to the end of the list.

 list.pop(index): removes the item at the specified index. The method also returns the removed item.

• list.reverse(): reverses the elements of the list.

• list.sort(): sorts the items of a list in ascending or descending order.

List indexing and slicing

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Practice Problem

Assume:

```
list_1 = ['a', 'b', 'c']
list_2 = ['d', 'e']
```

List

```
1 list_1.append('d')  # ['a', 'b', 'c', 'd']
2 list_1.extend(list_2)  # ['a', 'b', 'c', 'd', 'e']
3 list_1.pop(1)  # ['a', 'c']
4 list_1.reverse()  # ['c', 'b', 'a']
5 list_1.sort(reverse=True)  # ['c', 'b', 'a']
6 list_1[-1]  # 'c'
7 list_1[1:]  # ['b', 'c']
```

Loops



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For loop

• For each item in a collection:

```
• for element in list:
```

- for key in dict:
- for key in dict.keys():
- for value in dict.values():
- for key, value in dict.items():
- For value in range:
 - for i in range(len(my_list)):
- While loop: only executes while the Boolean expression is true

Tuple



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• Immutable (unchangeable)

Tuple indexing (the same as what we do for List)

Unpacking a Tuple

Tuple

```
1 my_tuple = (1, 2, 3)
2 my_tuple[1] = 4  # thorw an error
3 my_tuple[1]  # return 2

4
5 a, b, c = my_tuple  # unpack a tuple
6 print(a)  # 1
7 print(b)  # 2
8 print(c)  # 3
```

Dictionary



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Practice Problem • Key: Value pairs

Dictionary

```
my_dict = {'a': 1, 'b': 2, 'c': 3}
my_dict['d'] = 4  # create a new key-value pair
my_dict.get('c')  # return 3
my_dict.get('e', 0) # return 0

# print key-value pairs in loop
for key, value in my_dict.items():
print(key, value)
```

Turtle



Turtle

Turtle methods

- forward(distance)
- backward(distance)
- color(str)
- goto(x, y)
- left(degree)
- right(degree)
- pendown()
- penup()
- setheading((degree))
- Screen methods
 - screensize(number)
 - bgcolor(str)
 - exitonclick()

Terminal



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Practice Problem

Terminal Commands:

- cd: Change Directory
- pwd / chdir: Print working (current) directory
- ls / dir: List content of directory

Git and GitHub



Git and GitHub

Git Commands:

- git clone: make a copy of your remote repository on your local computer
- git add: add file to your staging area
- git commit -m "message": make a snapshot of your local repository
- git push: send your committed local changes to remote repository (GitHub)
- git status: display the information for current stage

Class and Object



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Practice Problem Class: defines what all objects of the class know (attributes) and can do (methods)

- Attribute: Variable which is defined inside a class
 - class attribute: the variable defined in the class but outside the methods.
 - object attribute: the variable defined with self. (usually inside __init__())
- Object: an instance of a class
- Inheritance: "is a type of" (dog is a type of animal)
- Association: "has a" (animal has a name)

Class and Object



Class and Object

Class and Object

```
class MyClass:
       a = 'This is a class attribute' # This is a class attribute
       def __init__(self, b):
           self.b = b # This is an object attribute
6
       def my_method(self, c):
           # attributes can be accessed inside the class with 'self' keyword
           print(self.a)
           print(self.b)
10
           # parameters can only be accessed inside this method
11
           print(c)
12
```

Unit Test



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Practice Problem

Unit Test

```
import unittest
2
   class TestAll(unittest.TestCase): # make a subclass of unittest.TestCase
       def setUp(self): # setUp() will be executed before test cases
4
           self.mv_variable = 'some values'
6
       def test_my_function(self): # start each method with "test_"
           self.assertEqual(mv_function(), "expected output")
           self.assertAlmostEqual(my_function(), 0.02 , places=2)
9
           self.assertTrue(my_function())
10
           self.assertFalse(my_function())
11
12
   unittest.main() # run all tests
```

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Practice Problem CSV (Comma Separated Values) files are a simple and lightweight way to store structured data.

- CSV are a common format for sharing datasets.
- a CSV file represents data as a series of rows and columns, much like an Excel spreadsheet or a matrix.
- Header row: the first row of a CSV usually contains the name of each column. Most CSV files have one, but this is not required.
- Each line of a CSV represents a row. Usually the columns are separated from each other using commas "," within each row.
- Other separators such as tabs " $\t^{"}$ " and pipes " $\t^{"}$ " can be used, but commas are by far the most common.

CSV File Example



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Practice Problem

forestfires.csv

```
1 month,day,temp,RH,area
```

- 2 jul, tue, 18.0, 42, 0.36
- 3 sep, tue, 21.7, 38, 0.43
- 4 aug, wed, 23.3, 31, 0.55
 - Here the first line is header row
 - Each row represents a set of data
 - No need for additional spaces between commas.

Newline Characters \n



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Practice Problem

demo.txt

- 1 this is the first row
- 2 this is the second row
 - When we open a CSV file in a program like Excel or an IDE like VSCode, the rows are automatically placed onto their own line for readability.
 - However computers don't have eyes, so they need to use a special character called a newline to know where one line should end and one should begin.
 - A newline character is represented in Python as \n and it counts as a single character: len('\n') == 1 would return True
 - The above file equals "this is the first row\nthis is the second row"

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Discussion 6 Exercise



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Practice Problem Go to Canvas → Assignment → Discussion 6 and clone the GitHub Repo https://classroom.github.com/a/RH4n_meN

We will be working with a dataset of Forest Fires

forestfires.csv

- month: month of the year: 'jan' to 'dec'
- day: day of the week: 'mon' to 'sun'
- temp: temperature in Celsius degrees: 2.2 to 33.30
- RH: relative humidity in
- area: the burned area of the forest (in hectares): 0.09 to 1090.84

Discussion 6 Exercise



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Practice Problem

Your task

- Our task is to read in the CSV file and builds a dictionary called data_dict
- Fix the bugs in the build_data_dict() method
- Implement all methods of the FireReader class
- Don't change test cases

```
1 self.data_dict = {
2    'month': ['jul', 'sep', 'sep', ...],
3    'day': ['tue', 'tue', 'mon', ...],
4    'temp': [18.0, 21.7, 21.9, ...],
5    'RH': [42, 38, 39, ...],
6    'area': [0.36, 0.43, 0.47, ...]
7 }
```