SMU | Lyle School of Engineering

CS 1340 Introduction to Computing Concepts

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Agenda

- Agenda:
  - Go through the quiz
    - Average: 29.62
    - Highest : 47
  - File Handling

File Handling

- Input() and print() allow you to get input from and output data to the standard device (screen)
- Often the case, you need to write your data to a file for later use or reading data from files. This makes your program more usable.
- Python has several functions for creating, reading, updating, and deleting files

File Handling

- The key function for working with files is the open() function.
- The open() function takes two parameters: *filename* and *mode*
- There are four different modes for opening a file
  - "r" - Read-Default value. Opens a file for reading, error if the file does not exist
  - "a" - Append- Opens a file for appending, creates the file if it does not exist
  - "w"- Write- Opens a file for writing, create the file if it does not exist
  - "x" - Create -Creates the specified file, returns an error if the file exists

File Handling

- In addition you can specify if the file should be handled as binary or text mode
  - "t" -Text - Default value. Text mode
  - "b" - Binary - Binary mode (e.g. images)
- However, when working with special file like images or cvs, json files, we usually use third party libraries, rather than using the built in functions.

File Handling

- Open a file
  - To open the file, use the built-in open() function.
  - The open() function returns a file object, which has a read() method for reading the content of the file

```
1    f = open("demofile.txt", "r")
2    print(f.read())
```

number_guessing × files ×

```
/Users/xinyi/anaconda/envs/mlearn/bin/python /Users/xinyi/Courses/cs1340/week4/files.py
Hello! this is demo txt file
It is for testing purpose
Good luck!

Process finished with exit code 0
```

File Handling

- Read parts of the file
  - use read() method and specify how many characters to read.

```
1   f = open("demofile.txt", "r")
2   print(f.read(5))
```

number_guessing × files ×

```
/Users/xinyi/anaconda/envs/mlearn/bin/python /Users/xinyi/Courses/cs1340/week4/files.py
Hello

Process finished with exit code 0
```

File Handling

- Read lines
  - You can return one line by using the readline() method

```
1    f = open("demofile.txt", "r")
2    print(f.readline())
```

```
number_guessing × files ×
/Users/xinyi/anaconda/envs/mlearn/bin/python /Users/xinyi/Courses/cs1340/week4/files.py
Hello! this is demo txt file


Process finished with exit code 0
```

File Handling

- Read lines
  - You can return one line by using the readline() method

```
1   f = open("demofile.txt", "r")
2   print(f.readline())
```

number_guessing × files ×

```
/Users/xinyi/anaconda/envs/mlearn/bin/python /Users/xinyi/Courses/cs1340/week4/files.py
Hello! this is demo txt file


Process finished with exit code 0
```

```
1   f = open("demofile.txt", "r")
2   print(f.readline())
3   print(f.readline())
4
```

number_guessing × files ×

```
/Users/xinyi/anaconda/envs/mlearn/bin/python /Users/xinyi/Courses/cs1340/week4/files.py
Hello! this is demo txt file

It is for testing purpose


Process finished with exit code 0
```

File Handling

- Read lines
  - Loop through the file line by line

```
1    f = open("demofile.txt", "r")
2    for l in f:
3        print(l)
4
```

for l in f

number_guessing × files ×

```
/Users/xinyi/anaconda/envs/mlearn/bin/python /Users/xinyi/Courses/cs1340/week4/files.py
Hello! this is demo txt file

It is for testing purpose

Good luck!

Process finished with exit code 0
```

File Handling

- Close files
  - You should always close your files, in some cases, due to buffering, change made to a file may not show until you close the file

```
1   f = open("demofile.txt", "r")
2   for l in f:
3       print(l)
4   f.close()
5
```

```
number_guessing × files ×
/Users/xinyi/anaconda/envs/mlearn/bin/python /Users/xinyi/Courses/cs1340/week4/files.py
Hello! this is demo txt file

It is for testing purpose

Good luck!

Process finished with exit code 0
```

Demo

File Handling

- With Statement
  - The keyword with closes the file once access to it is no longer needed
  - with syntax:

Indentation(4 spaces)

```
with  open(filename) as the_file:
    contents = the_file.read()
    print(contents)
...
```

Colon

First line with less indentation is considered to be outside of the with code block

File Handling

- With Statement

```
1   with open("demofile.txt") as the_file:
2       contents = the_file.read()
3       print(contents)
4
5   print("This is another print statement")
6
```

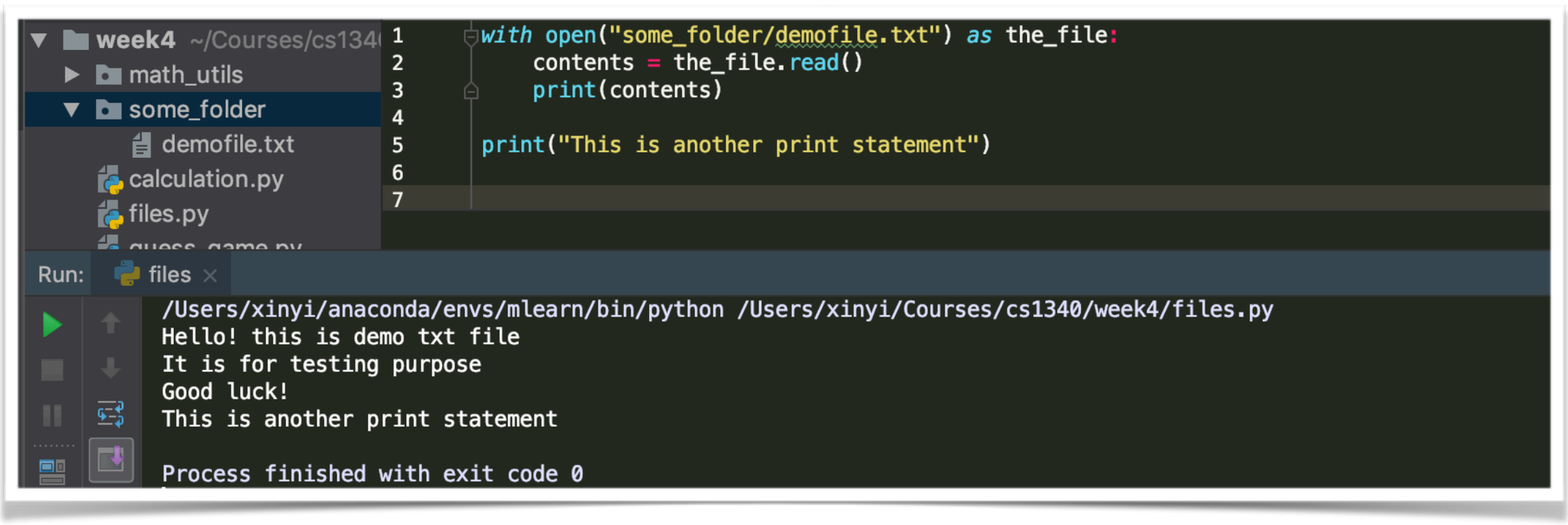
files

```
/Users/xinyi/anaconda/envs/mlearn/bin/python /Users/xinyi/Courses/cs1340/week4/files.py
Hello! this is demo txt file
It is for testing purpose
Good luck!
This is another print statement

Process finished with exit code 0
```

File Handling

- File Paths
  - when you pass a simple filename to open() function, Python looks in the directory where the file that's currently being executed



File Handling

- Using absolute file path
  - On Linux and MacOS, absolute paths look like this:

```
file_path = 'home/eric/other_files/text_files/filename.txt'
with open(file_path) as file_object:
```

  - On Windows they look like this:

```
file_path = 'C:\users\eric\other_files\text_files\filename.txt'
with open(file_path) as file_object:
```

Note: Hard code an absolute file path may not be a good idea. May cause error if run at a different operating system. Using pathlib for more info https://docs.python.org/3/library/pathlib.html

File Handling

- Making a list of lines from a file
  - The file object returned by open() is only available inside the with block that contains it
  - Store lines to list for later process

```
1   with open("some_folder/demofile.txt") as the_file:
2       lines = the_file.readlines()
3
4   for l in lines:
5       print(l)
```

files ×

```
/Users/xinyi/anaconda/envs/mlearn/bin/python /Users/xinyi/Courses/cs1340/week4/files.py
Hello! this is demo txt file

It is for testing purpose

Good luck!

Process finished with exit code 0
```

File Handling

- Writing to an empty file
  - specify the "w" write mode
  - will create a new file if not exist

```
1  filename = "programming.txt"
2
3  with open(filename, "w") as the_file:
4      the_file.write("Python is easy.")
5
6
```

with open(filename, "w") as the...

write_message

```
/Users/xinyi/anaconda/envs/mlearn/bin/python /Users/xinyi/Courses/cs1340/week4/write_message.py

Process finished with exit code 0
```

File Handling

- Writing multiple lines
  - specify the "w" write mode
  - will create a new file if not exist
  - will overwrite the original content if file exist

```
1      filename = "programming.txt"
2
3      with open(filename, "w") as the_file:
4          the_file.write("Python is easy.")
5          the_file.write("I love programming.")
6
7
```

with open(filename, "w") as the...

write_message

```
/Users/xinyi/anaconda/envs/mlearn/bin/python /Users/xinyi/Courses/cs1340/week4/write_message.py

Process finished with exit code 0
```

File Handling

- Appending to a file
  - use the "a" appending mode
  - will create a new file if not exist

```
1      filename = "programming.txt"
2
3      with open(filename, "a") as the_file:
4          the_file.write("Python is easy.")
5          the_file.write("I love programming.")
6
```

write_message

```
/Users/xinyi/anaconda/envs/mlearn/bin/python /Users/xinyi/Courses/cs1340/week4/write_message.py

Process finished with exit code 0
```

File Handling

- Work with multiple files

```
1    def count_words(filename):
2        """Count the approximate number of words in a file"""
3        with open(filename) as the_file:
4            contents = the_file.read()
5            words = contents.split()
6            num_words = len(words)
7            print("The file" + filename + "has about " + str(num_words) + " words.")
8
9    filename = "programming.txt"
10   count_words(filename)
11
```

```
count_words ×
/Users/xinyi/anaconda/envs/mlearn/bin/python /Users/xinyi/Courses/cs1340/week4/count_words.py
The fileprogramming.txthas about 9 words.

Process finished with exit code 0
```

Demo

Work with json in Python

- de facto standard for information exchange.
  - gathering information through an API
  - store your data in a document
- Other format include XML, YAML

JSON

```
{
    "firstName": "Jane",
    "lastName": "Doe",
    "hobbies": ["running", "sky diving", "singing"],
    "age": 35,
    "children": [
        {
            "firstName": "Alice",
            "age": 6
        },
        {
            "firstName": "Bob",
            "age": 8
        }
    ]
}
```

Store data using json

- Saving data to disk in a more organized way using json (instead of plain text)

```python
import json

data = {
    "player" : {
        "name": "jake",
        "age" : 30
    }
}

filename = "players.json"
with open(filename, "w") as write_file:
    json.dump(data, write_file)
```

```python
import json

filename = "players.json"

with open(filename) as f_obj:
    player = json.load(f_obj)

print(player)
```

```
json_example
/Users/xinyi/anaconda/envs/mlearn/bin/python /Users/xinyi/Courses/cs1340/week4/json_example.py
{'player': {'name': 'jake', 'age': 30}}

Process finished with exit code 0
```

Store data using json

- Using json.dump() and json.load()

```python
import json

numbers = [2, 3, 4, 5, 6, 12]

filename = "numbers.json"
with open(filename, "w") as f_obj:
    json.dump(numbers, f_obj)

```

number_write

```
/Users/xinyi/anaconda/envs/mlearn/bin/python /Users/xinyi/Courses/cs1340/week4/number_write.py

Process finished with exit code 0
```

```python
import json

filename = "numbers.json"
with open(filename) as f_obj:
    numbers = json.load(f_obj)


print(numbers)

```

number_read

```
/Users/xinyi/anaconda/envs/mlearn/bin/python /Users/xinyi/Courses/cs1340/week4/number_read.py
[2, 3, 4, 5, 6, 12]

Process finished with exit code 0
```