Data Files and Reading Data

Programming and Algorithms

Lecture by

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```python
n = 3
for i in range(1,n+1):
    print("Hello World!")
```
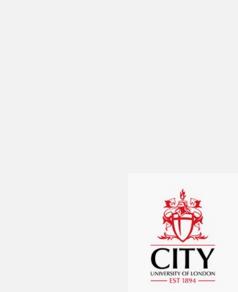
```
Hello World!
Hello World!
Hello World!
```

What will we Cover?

- Understanding why we use files

- Opening and reading data from a file

Why use files?

- Re-entering data each time a program runs is inefficient, especially for large inputs

- Data is lost when the program terminates, and the execution is complete

- The output on a screen (screen size) may not be sufficient to show all the results

Types of Files

There are many different types of files, common examples include:

- Text file types (TXT, PDF…)

- Image file types (JPEG, PNG…)

- Audio file types (MP3, WAV…)

- Video file types (GIF, MP4…)

- Presentation file types (PPT, ODP…)

Text Files

- A sequence of strings on disk

- All text file types use an encoding system (e.g., ASCII or UTF-8) to record the characters

- Text files can be viewed or modified using a text editor (e.g., Notepad)

OPEN Function I

- `open()` function is used in python program to access data in files
- It takes two arguments of type string: file name and access mode
- Access mode can be one of the following:
    - "r" – used to open a file for reading only
    - "w" – used to open a file for writing only
    - "a" – used to open a file for appending data; data is written to the end of the file

OPEN Function II

- Use an assignment statement, with open() on the right

```python
# open file 'my_file' in reading mode
f1 = open("my_file.txt", "r")
```

- Close the file by using close() function, when done

```python
# close file 'my_file'
f1.close()
```

Ways to Read a Text File

- `read()` method – used to read the entire contents of a file and record them as a string

- `readline()` method – used to read one line from file and return as string, returns empty string when there are no more lines left in the file

- `readlines()` method – used to read all lines from a file and return as a list of strings

Example I

- Create a file using notepad editor in the same directory as your .ipynb files

- Copy and paste the following text into the simple text file using Notepad (Windows) or TextEdit (Mac OS):

```
It was the best of times, it was the worst of times,
it was the age of wisdom, it was the age of foolishness,
it was the epoch of belief, it was the epoch of incredulity,
it was the season of Life, it was the season of Darkness,
it was the spring of hope, it was the winter of despair,
we had everything before us, we had nothing before us
```

Example II

- read() method produces the following string

```
f1 = open("my_file.txt", "r")
s = f1.read()
f1.close()
s
```

'It was the best of times, it was the worst of times,\nit was
the age of wisdom, it was the age of foolishness,\nit was the
epoch of belief, it was the epoch of incredulity,\nit was the
season of Life, it was the season of Darkness,\nit was the spr
ing of hope, it was the winter of despair,\nwe had everything
before us, we had nothing before us\n'

Example III

- `readlines()` method produces the following list of strings

```python
f1 = open("my_file.txt", "r")
s = f1.readlines()
f1.close()
s
```

```
['It was the best of times, it was the worst of times,\n',
 'it was the age of wisdom, it was the age of foolishness,\n',
 'it was the epoch of belief, it was the epoch of incredulity,\n',
 'it was the season of Life, it was the season of Darkness,\n',
 'it was the spring of hope, it was the winter of despair,\n',
 'we had everything before us, we had nothing before us\n']
```

Example IV

- readline() method produces a string
  of the first line of text in the text file

```python
f1 = open("my_file.txt", "r")
s = f1.readline()
f1.close()
s
```

```
'It was the best of times, it was the worst of times,\n'
```

Example V

- ▪ `readline()` method can be used again to access subsequent lines from the text file
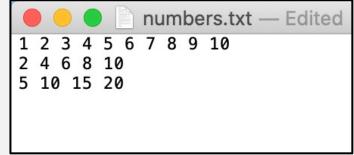
```python
f1 = open("my_file.txt", "r")
s = f1.readline()
s = f1.readline()
f1.close()
s
```

```
'it was the age of wisdom, it was the age of foolishness,\n'
```

Try It Yourself

Write a program in python environment that

- Reading a text file line by line

- Calculates the total of all numbers read from the file

- Numbers may appear in a sequence like in the example on the right

numbers.txt — Edited

```
1 2 3 4 5 6 7 8 9 10
2 4 6 8 10
5 10 15 20
```

numbers - Notepad

File Edit Format View Help

```
1 2 3 4 5 6 7 8 9 10
2 4 6 8 10
5 10 15 20
```

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