Python Basic Course

Part III

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Outline

- Part I: introduction and basics
  - What is Python
  - Tools and “hello world”
  - Basic syntax and data types
    - assignments, types and operators
    - conditional blocks and loops
- Part II: architecture
  - Functions
  - Scope
  - Built-ins
  - Modules

- Part IV: manipulating data
  - List operations
  - String operations
  - Dealing bad data
  - Reading and writing files
- Part VI: Pandas
  - Series and Dataframes
  - Common operations
  - How to read documentation

List operations

➔ *Appending*

- Appending an element to the end:

```
my_list = [13,14,15,16]
my_list.append(22)
print(my_list)
```

```
[13, 14, 15, 16, 22]
```

List operations

➔ *Popping*

- Popping an element (from the end):

```
my_list = [13,14,15,16]
print(my_list.pop())
print(my_list)
```

```
16
[13, 14, 15]
```

List operations

➔ *Slicing*

- Slicing a list uses the “double column” notation:

```
my_list = [13,14,15,16]
print(my_list[1:3])
```

```
[14, 15]
```

List operations

➔ *Slicing*

- Slicing a list uses the “double column” notation:

```
my_list = [13,14,15,16]
print(my_list[:3])
```

```
[13, 14, 15]
```

List operations

➔ *Slicing*

- Slicing a list uses the “double column” notation:

```
my_list = [13,14,15,16]
print(my_list[2:])
```

```
[15, 16]
```

List operations

➔ *Slicing*

- Slicing a list uses the “double column” notation:

```
my_list = [13,14,15,16]
print(my_list[:-1])
```

```
[13, 14, 15]
```

List operations

➔ *Concatenation*

- I can concatenate two lists

```
my_list_1 = [13,14,15,16]
my_list_2 = [21,22]
print(my_list_1 + my_list_2)
```

```
[13, 14, 15, 16, 21, 22]
```

String operations

➜ *Slicing*

- Slicing a string uses the same “double column” notation as the list:

```
my_string = 'hello'
print(my_string[1:3])
```

```
el
```

String operations

➜ *Access by negative index*

- I can easily access the last character

```
my_string = 'hello'
print(my_string[-1])
```

```
o
```

String operations

➜ *Concatenation*

- I can easily concatenate strings

```
my_string_1 = 'hello'
my_string_2 = 'anyone'
print('Hey ' + my_string_1 + ' ' +my_string_2 + '!')
```

```
Hey hello anyone!
```

String operations

➜ *Formatting*

- ...or format them:

```
my_string_1 = 'hello'
my_string_2 = 'anyone'
print('Hey {} {}!'.format(my_string_1, my_string_2))
```

```
Hey hello anyone!
```

String operations

➜ *Replacing*

- I can also replace parts of the string

```
my_string = 'Hello world!'
print(my_string.replace('world', 'anyone'))
```

```
Hello anyone!
```

String operations

➜ *Uppercasing*

- ..or make it uppercase

```
my_string = 'Hello world!'
print(my_string.upper())
```

```
HELLO WORLD!
```

String operations

➜ *Splitting*

- The split is very useful when parsing data:

```
my_string = 'Hello anyone'
print(my_string.split(' '))
```

```
['Hello', 'anyone']
```

String operations

➔ *Cleaning*

- I can remove leading and trailing spaces, tabs and newline characters

```
my_string = '\t  Hello world!  \n'
print('My string: "{}"'.format(my_string))
print('My string: "{}"'.format(my_string.strip()))
```

```
My string: "      Hello world!
"
My string: "Hello world!"
```

String operations

➜ *Conversions*

- I can convert strings to the numbers they naturally represent

```
my_string = '5.76'
my_number = float(my_string)
```

String operations

➜ *Conversions*

- When I convert (cast), the strip() function is automatically applied

```
my_string = '   5.76 \n'
my_number = float(my_string)
```

String operations

➜ *Conversions*

- It the conversion fail, I have a value error:

```
my_string = '3,14'
my_number = float(my_string)
```

```
Traceback (most recent call last):
  File "main.py", line 2, in <module>
    my_number = float(my_string)
ValueError: could not convert string to float: '3,14'
```

String operations

➔ *Conversions*

- It the conversion fail, I have a value error:

```
my_string = None
my_number = float(my_string)
```

```
Traceback (most recent call last):
  File "main.py", line 2, in <module>
    my_number = float(my_string)
TypeError: float() argument must be a string or a
number, not 'NoneType'
```

Dealing with bad data

➜ *Check for type*

- I can check for type before the conversion to prevent crashes:

```
my_var = 3
if type(my_var) not in [int, float, str]:
    print('Cannot use or convert type "{}"'.format(type(my_var)))
else:
    my_number = float(my_var)
    print(my_number)
```

```
3.0
```

Dealing with bad data

➔ *Check for type*

- I can check for type before the conversion to prevent crashes:

```
my_var = None
if type(my_var) not in [int, float, str]:
    print('Cannot use or convert type "{}"'.format(type(my_var)))
else:
    my_number = float(my_var)
    print(my_number)
```

```
Cannot use or convert type "<class 'NoneType'>"
```

Dealing with bad data

➔ *Check for type*

- I can check also check for value before the conversion to prevent crashes:

```
my_var = 'a'
if type(my_var) not in [int, float, str]:
    print('Cannot use or convert type "{}"'.format(type(my_var)))
else:
    if type(my_var) == str and not my_var.isnumeric():
        print('Cannot convert value "{}"'.format(my_var))
    else:
        ...
```

```
Cannot convert value "a"
```

Dealing with bad data

➔ *How to ask for forgiveness...*

- However, the best way is usually to always try to do the conversion and handle the error when and if this occurs.
- This is done using the try- except logic, but we will not cover it here.
- Just FYI:

```
try:
    float(my_var)
except:
    # Handle the error
```

Reading and writing files

➔ *What is a file, afterall?*

- Files are convenient structures where to store data
- A common format for this is the CSV, which stands for Comma-Separated Values.
- Usually, for CSV files each line is an “entry”, which has “fields”
- An optional header might or might not be present on top.

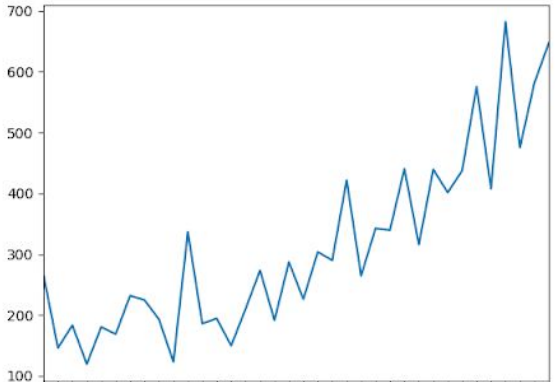
→ CSV files have several “dialects”, for example when values are separated with a semicolon instead of a comma.

Reading and writing files

➔ *The shampoo sales*

- We will use a simple example: The shampoo sales over a few years.

```
Date,Sales
01-01-2012,266.0
01-02-2012,145.9
01-03-2012,183.1
01-04-2012,119.3
...
```



Reading and writing files

➔ *How to read a file in Python*

- There are various ways, as for everything. The “open” function can open the file and return a file data type, that I can read in one go or line by line:

```
my_file = open('shampoo_sales.csv', 'r')
print(my_file.read())
my_file.close()
```

```
Date,Sales
01-01-2012,266.0
01-02-2012,145.9
01-03-2012,183.1
...
```

Reading and writing files

➔ *How to read a file in Python*

- There are various ways, as for everything. The “open” function can open the file and return a file data type, that I can read in one go or line by line:

```
my_file = open('shampoo_sales.csv', 'r')
print(my_file.readline())
print(my_file.readline())
my_file.close()
```

```
Date,Sales

01-01-2012,266.0

...
```

Reading and writing files

➔ *How to read a file in Python*

- There are various ways, as for everything. The “open” function can open the file and return a file data type, that I can read in one go or line by line:

```
my_file = open('shampoo_sales.csv', 'r')
for line in my_file:
    print(line)
my_file.close()
```

```
Date,Sales

01-01-2012,266.0

...
```

Reading and writing files

➔ *How to read a file in Python*

- Using also the “with” statement will automatically handle closing the file for us when we are done with it:

```
with open('shampoo_sales.csv') as my_file:
    for line in my_file:
        print(line)
```

```
Date,Sales

01-01-2012,266.0

...
```

Reading and writing files

➔ *How to read a file in Python*

- If I want to write to a file, I need to open it in write mode (“w”). To instead add content to an existing file, I have to open it in append mode (“a”).

```
with open('new_file.csv', 'w') as my_file:
    my_file.write('2013,22\n')
    my_file.write('2014,27\n')
    my_file.write('2015,25\n')
```

```
2013,22
2014,27
2015,25
```

End of part III

➔ *Questions?*

Next: exercise 3

Exercise 3

Write a function that sums all the values of a CSV file.

- Name it “**sum_csv**” and accept a parameter for the file name. Return the sum.
- You can assume that files always have:
  - a first header line with the labels (to be skipped)
  - a date as the first item of every line (to be skipped)
  - a single data column (to be summed)
- If the file is empty, the function must return “None”
- If there are values that cannot be converted to a numerical type, ignore the line without crashing the code