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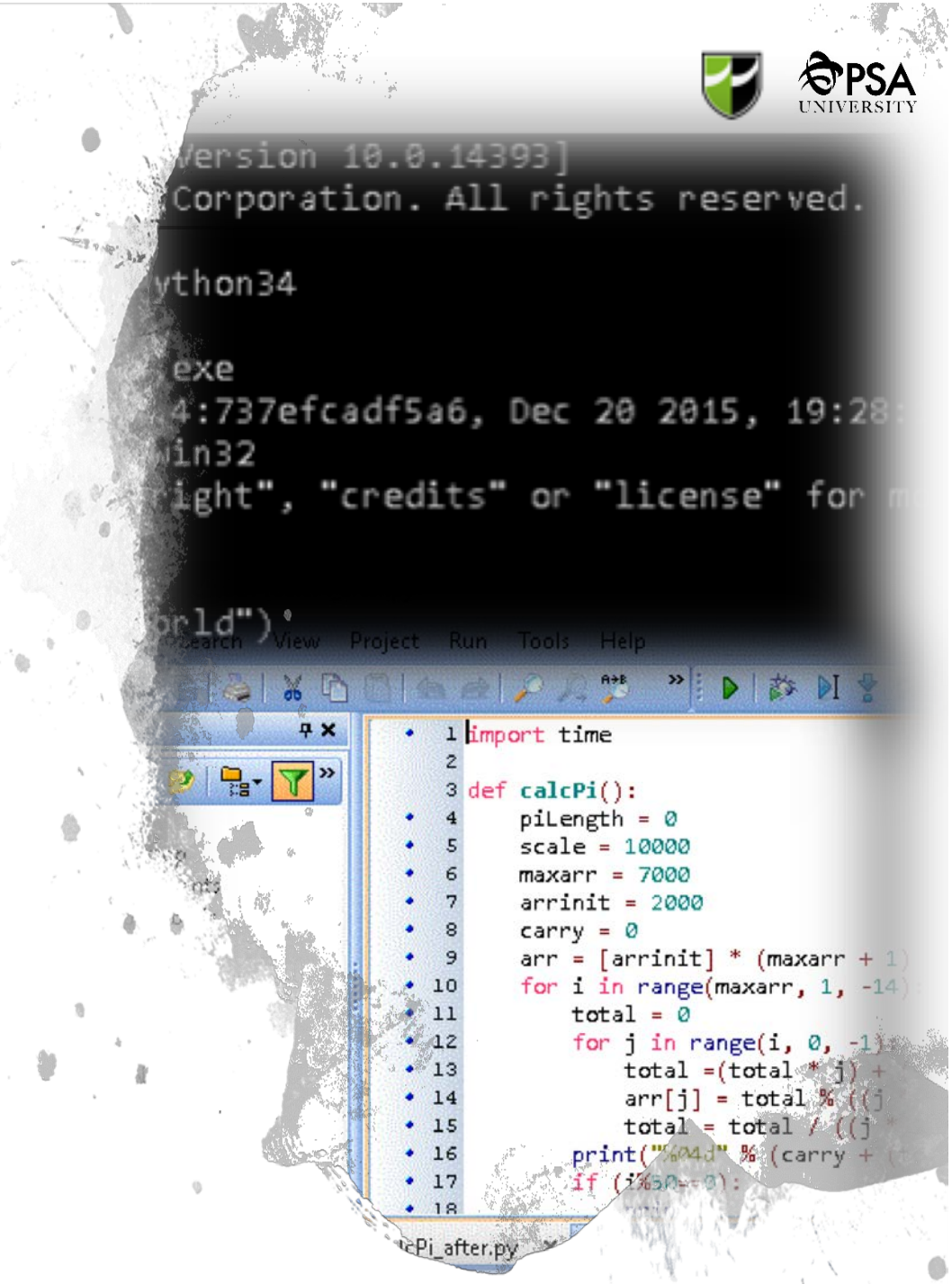
DISCOVER. TRANSFORM. ACHIEVE

Introductory Programming in Python

Day 2

Programme
Day One

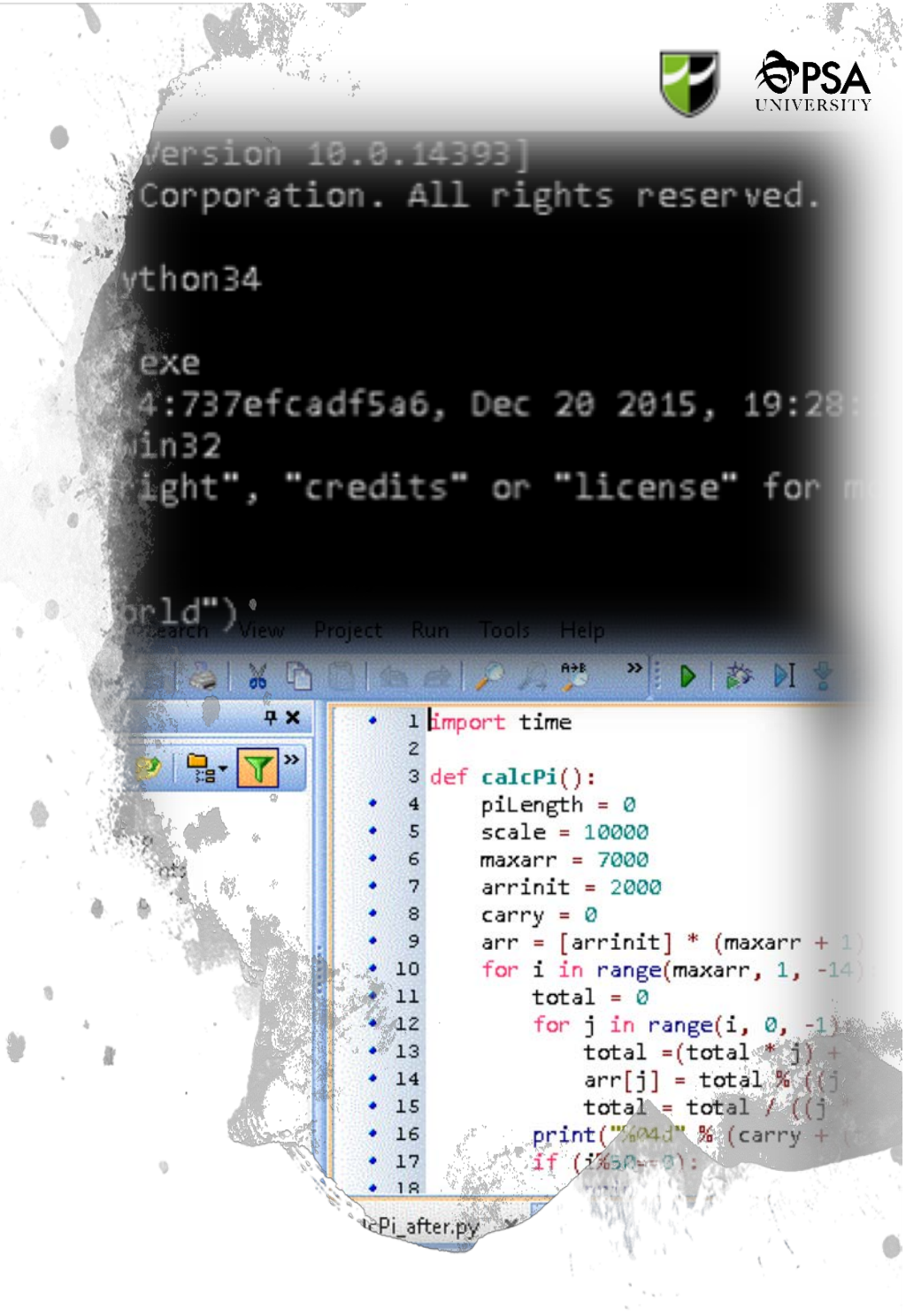
- A brief history of Python
- Setting up python environment
- Learn the basics:
  - Data types
  - Conversions
  - String operations
  - Functions
  - And more!
- String functions, formatting
- Find files by name, by extension, by size, by content and calculate the total size



What is a python project you would like to work on after this training?

Programme Day Two

- Read and writing files
- Copying, moving and deleting files and folders
- Working with Excel
- Processing CSV files
- Generating PDF
- Image processing
- Data Visualization - Charting
- Connecting to the Web
- Sending emails
- Telegram bot



File Paths

- Absolute & Relative file paths
- Use os.getcwd()

Absolute file paths are notated by a **leading forward slash or drive label**.
For example,
`/home/example_user/example_directory`
or
`C:/system32/cmd.exe`

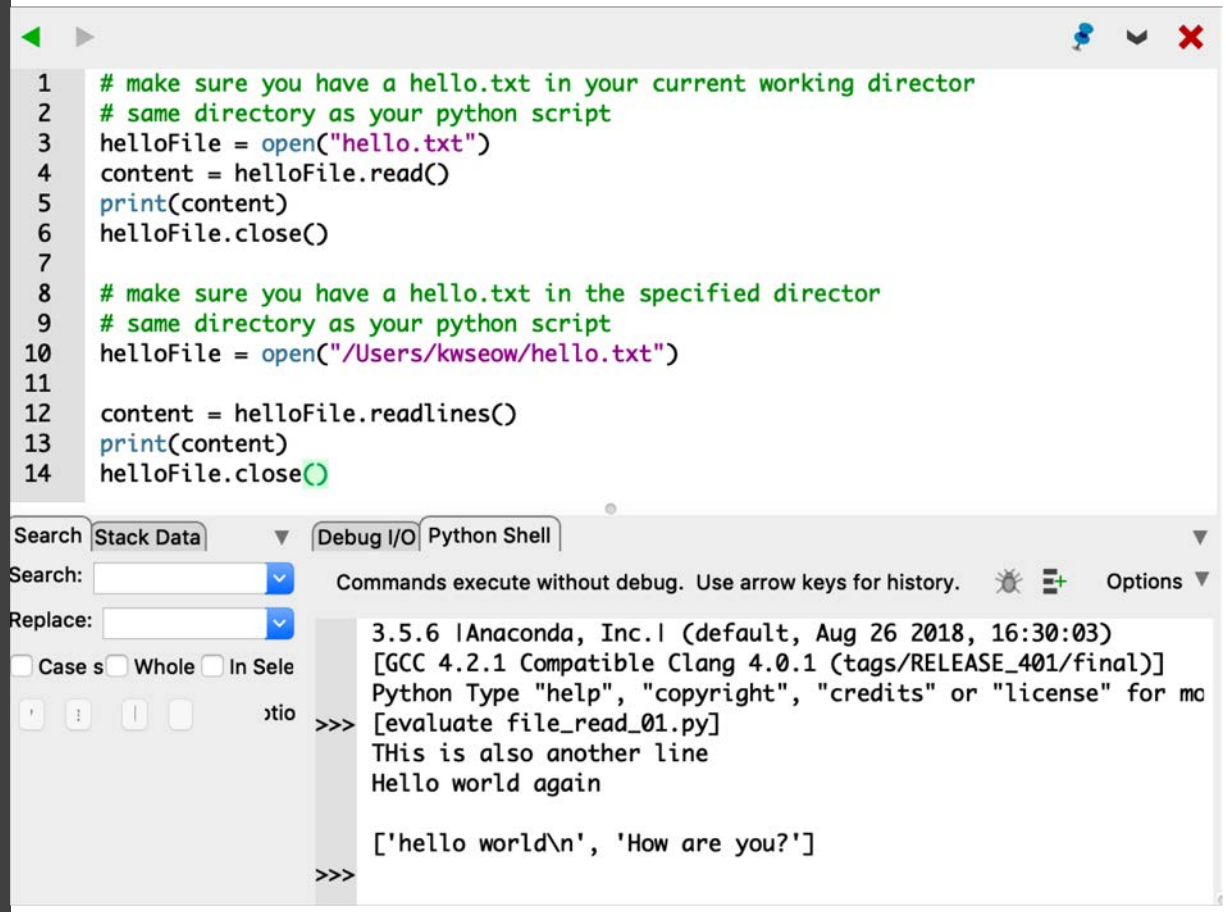
An absolute file path describes how to access a given file or directory, starting from the root of the file system. A file path is also called a *pathname*.

Relative file paths are notated by a **lack of a leading forward slash**.
For example,
`example_directory`.

A relative file path is interpreted from the perspective your current working directory. If you use a relative file path from the wrong directory, then the path will refer to a different file than you intend, or it will refer to no file at all..

Read files

- Open() will return a file object which has reading and writing related methods
- Pass ‘r’ (or nothing) to open() to open the file in read mode.
- Call read() to read the contents of a file
- Call readlines() to return a list of strings of the file’s content.
- Call close() when you are done with the file.



Write files

- Pass ‘w’ to open() to open the file in write mode or ‘a’ for append mode
- Opening a non-existent file in write or append mode will create that file
- Call write() to write a string to a file

```
1  # make sure you have a hello.txt in your current working director
2  # same directory as your python script
3  helloFile = open("hello.txt", "w")
4  char_written = helloFile.write("THis is also another line\n")
5  print("No of character written:",char_written)
6  helloFile.close()
7
8  # reopen to display content
9  helloFile = open("hello.txt")
10 print(helloFile.read())
11 helloFile.close()
12
13 # open the file for adding next text
14 helloFile = open("hello.txt", "a")
15 char_written = helloFile.write("Hello world again\n")
16 print("No of character written:",char_written)
17 helloFile.close()
18
19 # reopen to display content
20 helloFile = open("hello.txt")
21 print(helloFile.read())
22 helloFile.close()
```

Search | Stack Data | Debug I/O | Python Shell

Search:

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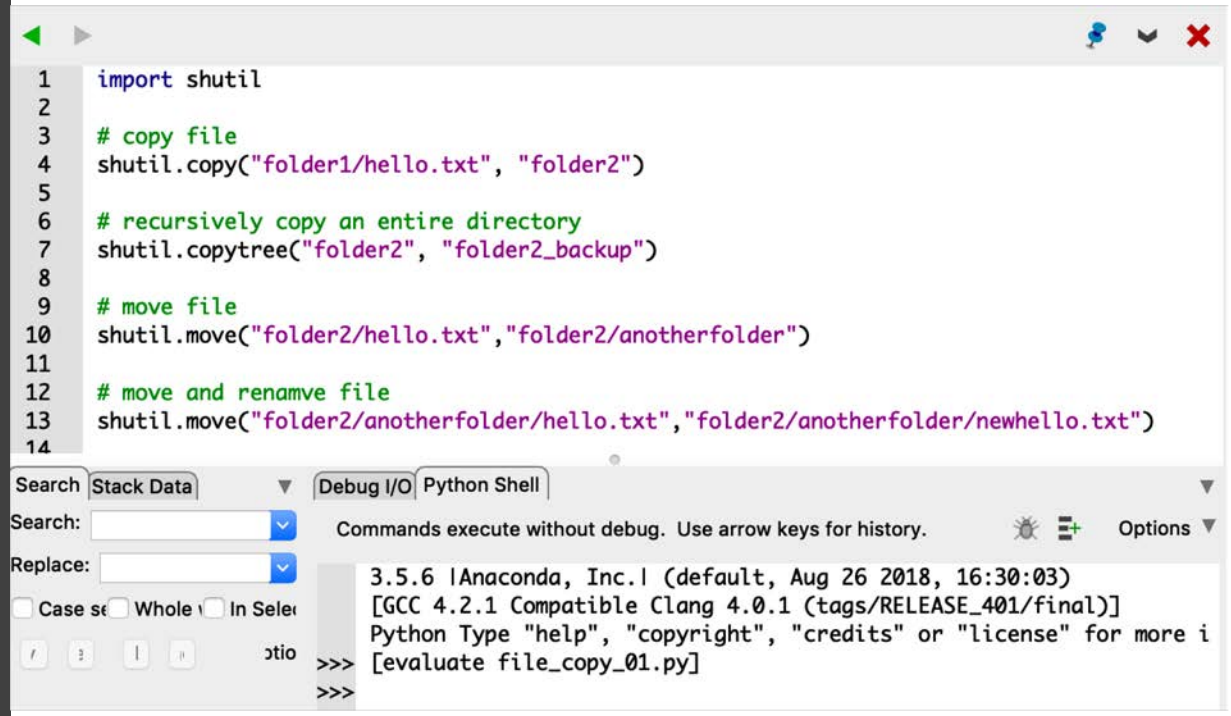
Commands execute without debug. Use arrow keys for history. Options

```
3.5.6 |Anaconda, Inc.| (default, Aug 26 2018, 16:30:03)
[GCC 4.2.1 Compatible Clang 4.0.1 (tags/RELEASE_401/final)]
Python Type "help", "copyright", "credits" or "license" for mo
>>> [evaluate file_write_01.py]
No of character written: 26
THis is also another line

No of character written: 18
THis is also another line
Hello world again
```

Copying and Moving Files

- shutil.copy(src, dst) – Copy the file src to the file or directory dst
- shutil.copytree(src, dst) - Recursively copy an entire directory tree rooted at src.
- shutil.move(src, dst) - Recursively move a file or directory (src) to another location (dst).



Deleting Files

- os.unlink() will delete a file
- os.rmdir() will delete a folder (but folder must be empty)
- shutil.rmtree() will delete a folder and all its contents
- Deleting can be dangerous, so do a dry run first

```
1  import os
2
3  print(os.getcwd())
4
5  # delete directory
6  #os.rmdir("folder2_backup")
7
8  import shutil
9  # delete directory
10 shutil.rmtree("folder2_backup")
11
```

Search | Stack Data | Debug I/O | Python Shell

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Commands execute without debug. Use arrow keys for hist Options

```
3.5.6 |Anaconda, Inc.| (default, Aug 26 2018, 16:30:03)
[GCC 4.2.1 Compatible Clang 4.0.1 (tags/RELEASE_401/final)
Python Type "help", "copyright", "credits" or "license" fo
>>> [evaluate file_delete_01.py]
/Users/kwseow/Dropbox/Projects/V7.PSA/Day2Resources
>>>
```

RemoveFiles.py

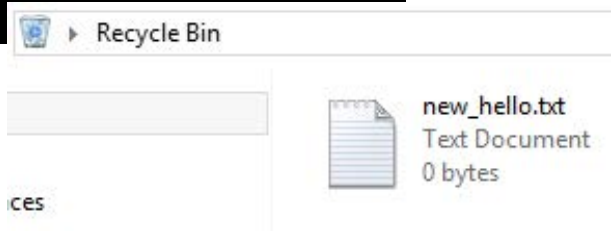
```
1  import os
2
3  os.chdir("C:\\Users\\charissa_chua\\Downloads")
4
5  for filename in os.listdir():
6      if filename.endswith(".docx"):
7          #os.unlink(filename)
8          print(filename)
```

send2trash module

- Install send2trash module using pip.exe
- send2trash.send2trash() will send a file or folder to the recycling bin

```
Administrator: Command Prompt
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.

C:\Users\charissa_chua>cd C:\Users\charissa_chua\PycharmProjects\ExerciseTwo\venv\Scripts

C:\Users\charissa_chua\PycharmProjects\ExerciseTwo\venv\Scripts>pip.exe install send2trash
Collecting send2trash
  Using cached https://files.pythonhosted.org/packages/49/46/c3dc27481d1cc57b9385aff41c474ceb7714f79
Installing collected packages: send2trash
Successfully installed send2trash-1.5.0
You are using pip version 10.0.1, however version 18.0 is available.
You should consider upgrading via the 'python -m pip install --upgrade pip' command.

C:\Users\charissa_chua\PycharmProjects\ExerciseTwo\venv\Scripts>
```

```
>>> import send2trash
>>> send2trash.send2trash("D:\\folder2\\new_hello.txt")
```



https://pypi.org/project/Send2Trash/

Walk a Directory

FileUtils.py

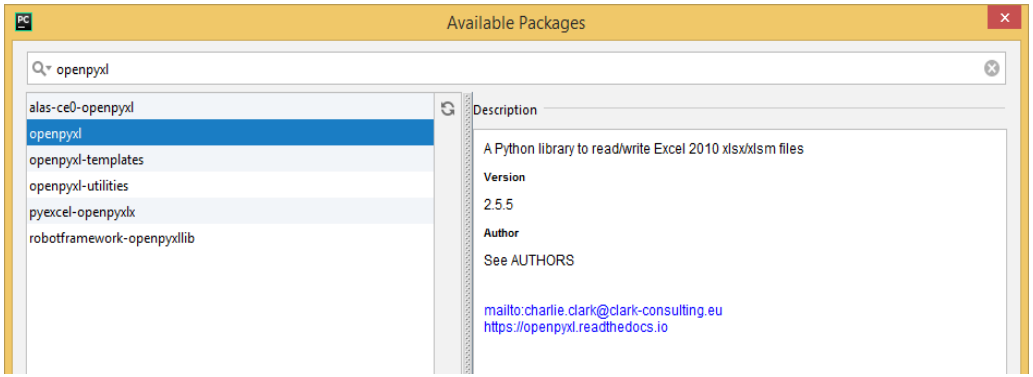
```
1   import os
2   import shutil
3
4   for folderName, subfolders, filenames in os.walk("C:\\Users\\charissa_chua\\Downloads"):
5       print("The folder is " + folderName)
6       print("The subfolders in " + folderName + " are: " + str(subfolders))
7       print("The filenames in " + folderName + " are: " + str(filenames))
8       print()
9
10      for subfolder in subfolders:
11          if "c235" in subfolder:
12              rmfolder = os.path.join(folderName, subfolder)
13              print("rmtree on " + rmfolder)
14              shutil.rmtree(rmfolder)
15
16
17      for file in filenames:
18          if file.endswith(".jpeg"):
19              srcFile = os.path.join(folderName, file)
20              dstFile = os.path.join(folderName, file + ".backup")
21              print(dstFile)
22              shutil.copy(srcFile, dstFile)
```

Remove all folders with “c235” in them

Back up all jpeg files with file extension “.backup”

Working with Excel

- Install openpyxl module using PyCharm or “pip install openpyxl”
- Make sure the file is available - students_attendance.xlsx
- Full openpyxl documentataion: https://openpyxl.readthedocs.io/en/stable/index.html



	A	B	C
1	**Student**	**Email**	**Status**
2	Alicia	code.musically@gmail.com	Present
3	Bryan	code.musically@gmail.com	Present
4	Carol	code.musically@gmail.com	Absent
5	David	code.musically@gmail.com	Absent
6	Evelyn	code.musically@gmail.com	Present
7			

Sheet1

https://openpyxl.readthedocs.io/en/stable/

Working with Excel

- Import openpyxl
- Load Excel content into “workbook“ object by specifying the entire path
- Get the active worksheet named "Sheet1"
- Get the number of rows and columns
- Use for loop to go through every row.
- Extract the status at Column C to check for attendance

```
1  import openpyxl
2
3  workbook = openpyxl.load_workbook("students_attendance.xlsx")
4  sheet=workbook["Sheet1"]
5
6  max_row = sheet.max_row
7  max_column = sheet.max_column
8
9  #loop through every row
10 for i in range(1,max_row+1):
11
12     #read cell
13     attendance = sheet.cell(row=i, column=3).value
14
15     #check attendance
16     if attendance == "Absent":
17         name = sheet.cell(row=i,column=1).value
18         email = sheet.cell(row=i,column=2).value
19         print(name + " is absent")
```

Working with Excel - Update

- Import openpyxl
- Load file into memory & get the sheet
- Add value to cell
- Save the spreadsheet

```python
import openpyxl
from openpyxl.comments import Comment

workbook = openpyxl.load_workbook("students_attendance.xlsx")
sheet=workbook["Sheet1"]

max_row = sheet.max_row
max_column = sheet.max_column

#read cell
for i in range(1,max_row+1):
    attendance = sheet.cell(row=i, column=3).value
    if attendance == "Absent":
        name = sheet.cell(row=i,column=1).value
        email = sheet.cell(row=i,column=2).value
        print(name + " is absent")

#add value
sheet['A7'].value='Felicia'
sheet['B7'].value='Felicia@gmail.com'
sheet['C7'].value='Present'

#add comment
sheet['A7'].comment= Comment('Change text automatically','User')

#add a new element that count the number of non empty cell
#sheet['D7'] = '=COUNTA(A2:A50)'

#save the file
workbook.save("students_attendance_comment.xlsx")
```

Working with Excel - Create

- Import openpyxl
- Create new workbook
- Get default sheet or create new sheet
- Insert value into cells
- Save spreadsheet

```python
import openpyxl

workbook = openpyxl.Workbook()

#get the default sheet
sheet=workbook["Sheet"]

#create a list of tuples as data source
data = [
    (225.7,'Gone with the Wind','Victor Fleming'),
    (194.4, 'Star Wars', 'George Lucas'),
    (161.0, 'ET: The Extraterrestrial', 'Steven Spielberg')
]

#update value into cell
for row, (admissions,name, director) in enumerate(data,1):
    sheet['A{}'.format(row)].value = admissions
    sheet['B{}'.format(row)].value = name

#create a new sheet
sheet = workbook.create_sheet("Directors")

#print out added sheet name
print(workbook.sheetnames)

#update value into cell
for row, (admissions,name, director) in enumerate(data,1):
    sheet['A{}'.format(row)].value = director
    sheet['B{}'.format(row)].value = name

#save the spreadsheet
workbook.save("movies1.xlsx")
```

Working with Excel - Format

- Import openpyxl & styles
- Set up colors and styles
- Loop through cell and set properties
- Save spreadsheet

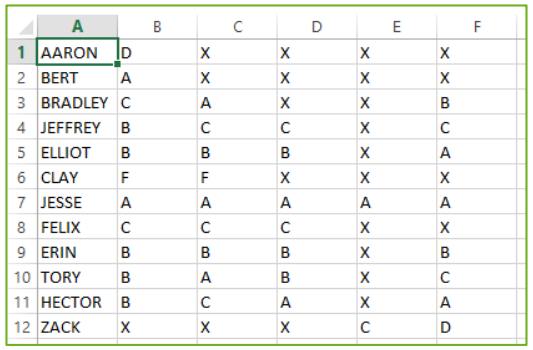
```python
import openpyxl
from openpyxl.styles import Font, PatternFill, Border, Side

workbook = openpyxl.Workbook()

# create a list of tuples as data source
data = [
  ('Name','Admission'),
  ('Gone with the Wind',225.7),
  ('Star Wars',161.0),
  ('ET: The Extraterrestrial',161.0)
  ]

sheet = workbook['Sheet']
for row in data:
  sheet.append(row)

#define the colors to use for styling
BLUE = "0033CC"
LIGHT_BLUE = "E6ECFF"
WHITE = "FFFFFF"

#define styling
header_font = Font(name="Tahoma", size=14, color=WHITE)
header_fill = PatternFill("solid", fgColor=BLUE)

# format header
for row in sheet["A1:B1"]:
  for cell in row:
    cell.font = header_font
    cell.fill = header_fill

#define styling
white_side = Side(border_style="thin", color=WHITE)
blue_side = Side(border_style="thin", color=BLUE)
alternate_fill = PatternFill("solid", fgColor=LIGHT_BLUE)
border = Border(bottom=blue_side, left=white_side, right=white_side)

# format rows
for row_index, row in enumerate(sheet["A2:B5"]):
  for cell in row:
    cell.border = border
    if row_index %2 :
      cell.fill = alternate_fill

workbook.save("movie_format.xlsx")
```

Working with CSV File

- **CSV** stands for Comma-Separated Values (sometimes also called Comma Delimited File).
- It is commonly used for storing data in a table structured format.
- Each line/row in the file is a data record.
- Each field in the row is separated using a comma. The comma serves as a column boundary (aka delimiter) that separates the values into different cells of a table. (see next slide)

What is CSV format?

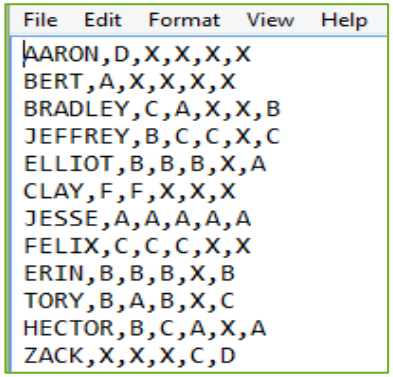
- The same data when viewed with Excel …



	A	B	C	D	E	F
1	AARON	D	X	X	X	X
2	BERT	A	X	X	X	X
3	BRADLEY	C	A	X	X	B
4	JEFFREY	B	C	C	X	C
5	ELLIOT	B	B	B	X	A
6	CLAY	F	F	X	X	X
7	JESSE	A	A	A	A	A
8	FELIX	C	C	C	X	X
9	ERIN	B	B	B	X	B
10	TORY	B	A	B	X	C
11	HECTOR	B	C	A	X	A
12	ZACK	X	X	X	C	D

Data is automatically tabulated in Excel into rows and columns (each value is in a cell)

- … and when viewed in plain text (e.g. in notepad) …



File Edit Format View Help

```
AARON,D,X,X,X,X
BERT,A,X,X,X,X
BRADLEY,C,A,X,X,B
JEFFREY,B,C,C,X,C
ELLIOT,B,B,B,X,A
CLAY,F,F,X,X,X
JESSE,A,A,A,A,A
FELIX,C,C,C,X,X
ERIN,B,B,B,X,B
TORY,B,A,B,X,C
HECTOR,B,C,A,X,A
ZACK,X,X,X,C,D
```

This is the RAW FORMAT of the file seen by computer programs:

- Each row is a record
- Values in a row are separated / delimited by comma ‘,’

Reading from a CSV File

1) Load CSV library

2) Open the file named 'W65Z.csv' for reading (indicated by 'r' argument). ***readerFileHandle*** linked the CSV file to the program.

```
1  import csv
2
3  with open("W65Z.csv", "r", newline='') as readerFileHandle:
4      reader1 = csv.reader(readerFileHandle)
5      #using for-loop to retrieve from the CSV file line by line
6      for row in reader1:
7          print (row)
8
9  readerFileHandle.close()
```

3) Read the file content as CSV format and store it in ***reader1*** as a **list of values**

4) For-loop retrieve each item in ***reader1*** **(a list)** into the loop variable ***row*** and display it. *(Note: Each line in the file becomes a list of values)*

```
['AARON', 'D', 'X', 'X', 'X', 'X']
['BERT', 'A', 'X', 'X', 'X', 'X']
['BRADLEY', 'C', 'A', 'X', 'X', 'B']
['JEFFREY', 'B', 'C', 'C', 'X', 'C']
['ELLIOT', 'B', 'B', 'B', 'X', 'A']
['CLAY', 'F', 'F', 'X', 'X', 'X']
```

5) Close the file (remove the link)

Note: There are other libraries/modules that have functions that read or write data in spreadsheets.

Writing to a CSV File

1) Load CSV library

2) Create (if new) & Open the file named "**W65z_new.csv**" for writing (indicated by 'w' argument). ***writerFileHandle*** links the file to the program.

```
1  import csv
2  with open("W65z_new.csv", "w", newline='') as writerFileHandle:
3      writer1 = csv.writer(writerFileHandle)
4
5      row1 = ['AARON', 'D', 'X', 'X', 'X', 'X']
6      row2 = ['BERT', 'A', 'X', 'X', 'X', 'X']
7      row3 = ['BRADLEY', 'C', 'A', 'X', 'X', 'B']
8      rowlist = [row1, row2, row3]
9
10     for row in rowlist:
11         writer1.writerow(row)
12
13 writerFileHandle.close()
```

3) "***writer1***" stores content to be written to the file in CSV format

4) ***rowlist*** stores the content to be written to the CSV file. (***rowlist*** is a list containing lists as items)

5) For-loop retrieves each item from ***rowlist*** into loop variable ***row*** → ***row*** (a list) is written as 1 csv formatted line into the file.

6) Close the file (Remove the link)

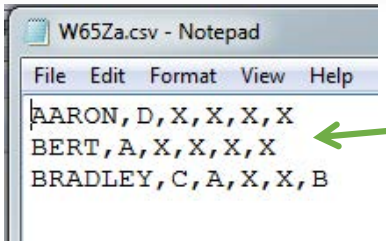


Image processing

For the next chapter we are going to use the new Python Image Library, or in short Pillow.

If it is not installed, you can install this package directly in PyCharm.

Alternatively, run the command: pip install Pillow

The documentation url is at: http://pillow.readthedocs.io/en/5.1.x/handbook/index.html

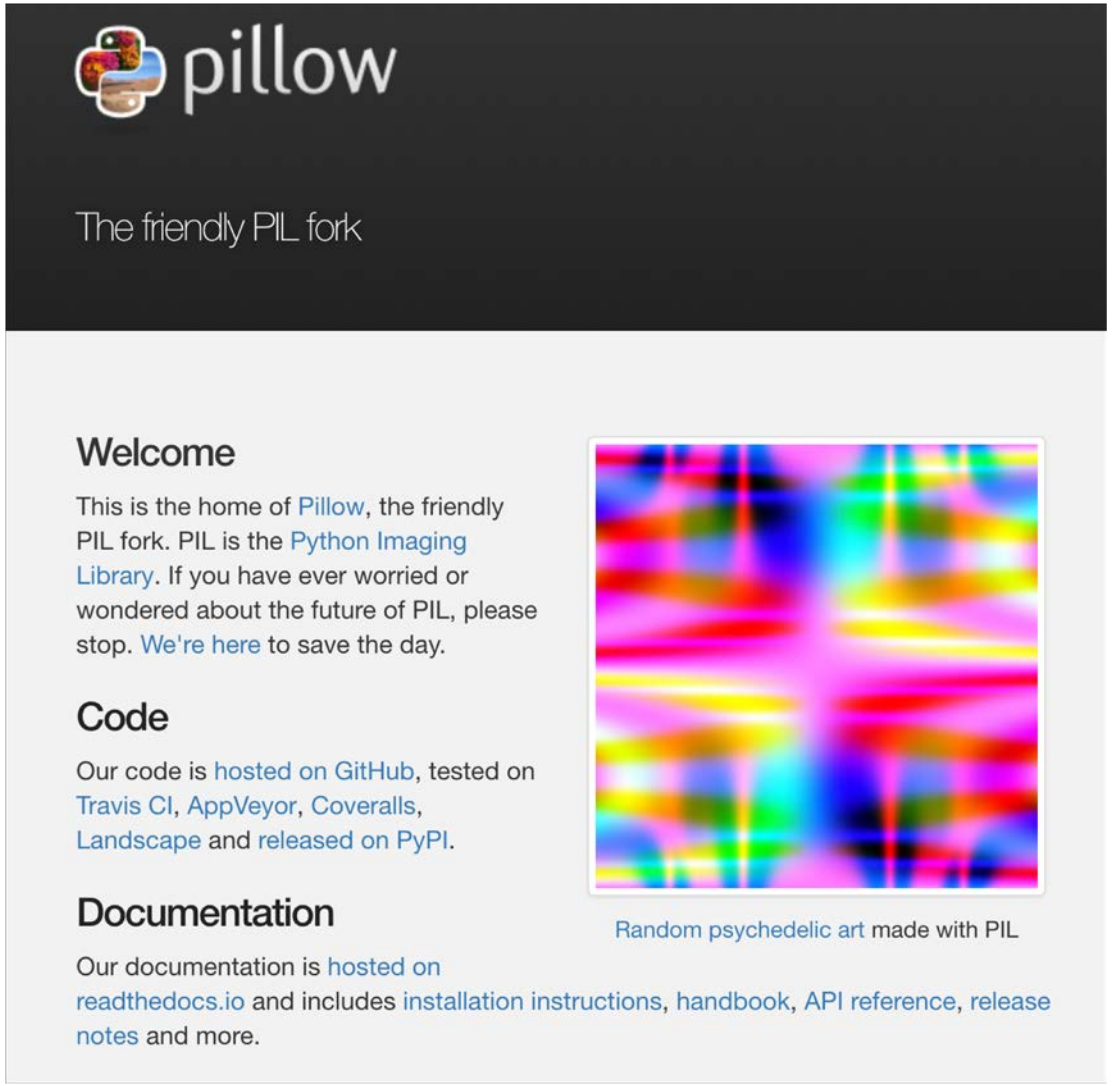


Image processing

Before we start processing images, we need to be able to loop through all the images.

Luckily we just learned how to do that, so let's start by copying last exercise in a new file.

You can retain the function searchByExtension, because that is the most useful one in this case.

```
1   import os
2
3   where = ".\\Day2Resource\\img\\"
4
5   def searchByExtension(ext):
6       c = 1
7       for root, dirs, files in os.walk(where):
8           for file in files:
9               fullname = os.path.join(root, file)
10              if file.endswith(ext):
11                  print ("%2d %s" % (c, fullname))
12                  c += 1
13
14  searchByExtension("jpg")
15
```

Also we would like to keep track of the number of images, so we add a variable c (for count), set it to 1 and increase it by one every time.

In the end you should have something like the image above.

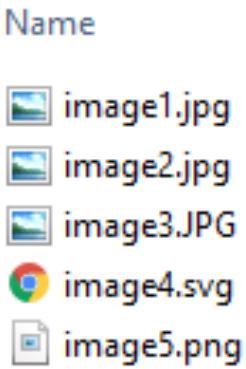
Image processing

When you run it, it should list all the .jpg in all folders.

However, not all images are in the list. There is one SVG image, one PNG image and 1 JPG image with extension in UPPER CASE. These don't match .endswith(".jpg").

Lets fix these and name the function processAllImages()

You can convert fileName to lower with fileName.lower().endswith(...)




```
C:\Users\denise_quek\AppData\Local\P:
 1 .\Day2Resource\img\image1.jpg
 2 .\Day2Resource\img\image2.jpg

Process finished with exit code 0
```

Image processing

This will print all the images, regardless of upper case.

Of course there are more types of images than JPEG, PNG and SVG.

You should now see a list of 5 images.

But if we want to experiment with the Image library, we don't want to apply it on all images, so let's add another parameter to the function called onlyFirst and abort the function after the first.

```
1   import os
2
3   where = ".\\Day2Resource\\img\\"
4
5   def processAllImages():
6       c = 1
7       for root, dirs, files in os.walk(where):
8           for file in files:
9               fullname = os.path.join(root, file)
10              if file.lower().endswith("jpg") or \
11                      file.lower().endswith("bmp") or \
12                      file.lower().endswith("png") or \
13                      file.lower().endswith("svg"):
14                  print("%2d %s" % (c, fullname))
15                  c += 1
16
17  processAllImages()
```

Image processing

Now our function will only process one if the parameter onlyFirst is set to True.

Not really a good name for this function, but let's go ahead with this.

Now we are ready to explore the Image library

```
1   import os
2
3   where = ".\\Day2Resource\\img\\"
4
5   def processAllImages(onlyFirst):
6       c = 1
7       for root, dirs, files in os.walk(where):
8           for file in files:
9               fullname = os.path.join(root, file)
10              if file.lower().endswith("jpg") or \
11                      file.lower().endswith("bmp") or \
12                      file.lower().endswith("png") or \
13                      file.lower().endswith("svg"):
14                  print("%2d %s" % (c, fullname))
15                  c += 1
16                  if (onlyFirst):
17                      return
18
19  processAllImages(True)
```

```
C:\Users\denise_quek\AppData\Local\Proc
 1 .\Day2Resource\img\image1.jpg

Process finished with exit code 0
```

Image processing

Let's explore what Pillow can do.

As a start we need to import it:

import Image

We can open images with
im = Image.open(fullname)

Then we can get the size of the image using im.size

```
1   import os
2   from PIL import Image
3
4   where = ".\\Day2Resource\\img\\"
5
6   def processAllImages(onlyFirst):
7       c = 1
8       for root, dirs, files in os.walk(where):
9           for file in files:
10              fullname = os.path.join(root, file)
11              if file.lower().endswith("jpg") or \
12                      file.lower().endswith("bmp") or \
13                      file.lower().endswith("png") or \
14                      file.lower().endswith("svg"):
15                  im = Image.open(fullname)
16                  print("%2d %s %s" % (c, fullname, im.size))
17                  im.show()
18                  c += 1
19                  if (onlyFirst):
20                      return
21
22  processAllImages(True)
```

Image processing

Let's print more info :
im.size, im.mode etc.

You can see the image with
im.show()

Note:
If your code does not fit on one line, you can use \ (backslash) and continue on the next.

```
1   import os
2   from PIL import Image
3
4   where = ".\\Day2Resource\\img\\"
5
6   def processAllImages(onlyFirst):
7       c = 1
8       for root, dirs, files in os.walk(where):
9           for file in files:
10              fullname = os.path.join(root, file)
11              if file.lower().endswith("jpg") or \
12                      file.lower().endswith("bmp") or \
13                      file.lower().endswith("png") or \
14                      file.lower().endswith("svg"):
15                  im = Image.open(fullname)
16                  print("%2d %s %s (%s)" % (c, fullname, im.size, im.mode))
17                  im.show()
18                  c += 1
19                  if (onlyFirst):
20                      return
21
22  processAllImages(True)
```

```
C:\Users\denise_quek\AppData\Local\Programs\Python\Python
 1 .\Day2Resource\img\image1.jpg (1599, 1066) (RGB)

Process finished with exit code 0
```

Image processing - filtering

Now that we can load and understand the image, it is time to try and modify it.

Pillow has many conversion and filters, we will use some of them. But if you need more, go ahead : http://pillow.readthedocs.io/en/5.1.x/handbook/index.html

To use filters we need to extend our import:
from PIL import Image, ImageFilter, ImageOps

The way you can apply filters is :
out = im.filter(ImageFilter.BLUR)

```
1   import os
2   from PIL import Image, ImageFilter
3
4   where = ".\\Day2Resource\\img\\"
5
6   def processAllImages(onlyFirst):
7       c = 1
8       for root, dirs, files in os.walk(where):
9           for file in files:
10              fullname = os.path.join(root, file)
11              if (file.lower().endswith("jpg") or \
12                      file.lower().endswith("bmp") or \
13                      file.lower().endswith("png") or \
14                      file.lower().endswith("svg")):
15                  im = Image.open(fullname)
16                  print("%2d %s size:%s (%s)" \
17                        % (c, fullname, im.size, im.mode))
18
19                  out = im.filter(ImageFilter.BLUR)
20                  im.show()
21                  out.show()
22                  c += 1
23                  if (onlyFirst):
24                      return
25
26  processAllImages(True)
```

Image processing - filtering

```
image = image.filter(ImageFilter.FIND_EDGES)
```

```
image = ImageOps.solarize(image)
```

```
image = ImageOps.grayscale(image)
```

```
image = image.filter(ImageFilter.CONTOUR)
```

Image processing - rotating

We can do a lot with images.
Let's look at rotation and flipping

Try to rotate and flip your images.

Another cool effect is to make it brighter by changing the contrast

Flipping the image horizontally or vertically

```
out = im.transpose(Image.FLIP_LEFT_RIGHT)
out = im.transpose(Image.FLIP_TOP_BOTTOM)
```

Rotating the image

```
out = im.transpose(Image.ROTATE_90)
out = im.transpose(Image.ROTATE_180)
out = im.transpose(Image.ROTATE_270)
```

Contrast

First add ImageEnhance to our imports:

```
from PIL import Image, ImageFilter, ImageEnhance
```

Then:

```
enh = ImageEnhance.Contrast(im)
out = enh.enhance(1.3)
```

Image processing - writing

You can see the image, but it's not being saved !

Let's agree we store the output images in \Day2Resource\img\out and store this string in a variable "outFolder" at line 5.

All you need to do to save the images in the "out" folder is: out.save(the name of the output file)

You know how we create the fullname, can you copy that line and use it to create outFilename? Then we use out.save(outFilename) after line 18.

```
1   import os
2   from PIL import Image, ImageFilter
3
4   where = ".\\Day2Resource\\img\\"
5
6   def processAllImages(onlyFirst):
7       c = 1
8       for root, dirs, files in os.walk(where):
9           for file in files:
10              fullname = os.path.join(root, file)
11              if (file.lower().endswith("jpg") or \
12                      file.lower().endswith("bmp") or \
13                      file.lower().endswith("png") or \
14                      file.lower().endswith("svg")):
15                  im = Image.open(fullname)
16                  print("%2d %s size:%s (%s)" \
17                        % (c, fullname, im.size, im.mode))
18
19                  out = im.filter(ImageFilter.BLUR)
20                  im.show()
21                  out.show()
22                  c += 1
23                  if (onlyFirst):
24                      return
25
26  processAllImages(True)
```

Image processing - writing

I hope you can see your converted image in the out folder now.

If you are ready, you can set the safety off (False) and convert all the images

We are going to convert our images again, so it would be good if we can clean up the out folder before we run our processAllImages.

Let's create a small function cleanOutput to delete all files in the output folder. You can use os.remove(fullName) to delete.

```
import os
from PIL import Image, ImageFilter

where = ".\\Day2Resource\\img\\"
outFolder = ".\\Day2Resource\\img\\out\\"

def processAllImages(onlyFirst):
    c = 1
    for root, dirs, files in os.walk(where):
        for file in files:
            fullname = os.path.join(root, file)
            if (file.lower().endswith("jpg") or \
                    file.lower().endswith("bmp") or \
                    file.lower().endswith("png") or \
                    file.lower().endswith("svg")):
                im = Image.open(fullname)
                outFilename = os.path.join(outFolder, file)
                print("%2d %s size:%s (%s)" \
                      % (c, fullname, im.size, im.mode))

                out = im.filter(ImageFilter.BLUR)
                im.show()
                out.show()
                out.save(outFilename)
                c += 1
                if (onlyFirst):
                    return

processAllImages(True)
```

Image processing - writing

Be careful, you don't want to delete your holiday photos !

You could have used the same code to walk through the files but use the outFolder instead !

Then for each file, you call the os.remove(fullName)

Calling it right before our processAllImages should make sure we have a clean output folder.

```
 7 def cleanOutput():
 8     print("Removing old out files")
 9     for root, dirs, files in os.walk(outFolder):
10         for file in files:
11             fullName = os.path.join(root, file)
12             os.remove(fullName)
13             print(".")
14     print("done")
```

```
cleanOutput()
processAllImages(True)
```

Image processing - watermark

Create the mark image
You can reduce the size to 100,100

```
mark = Image.open(".\\Day2Resources\\watermark.png")
mark = mark.resize((100,100))
```

Create a new function called
def watermark(im, mark, position):
....

It takes the original image, the watermark image and the desired position that we want the watermark to appear.
The function will return the result.

We can use this function
watermark(im, mark, (0, 50)).show()
or
imOut = watermark(im, mark, (0,50))
imOut.save(fileOut)

Maybe you want to leave a small footprint on your images, called watermark.

In this case we can use the \\Day2Resource\\watermark.png
and place it in each image on the bottom right.

Image processing - watermark

First we need to create a new layer with the size of the original image.

Then we paste the watermark image at the desired position and we return the composite.

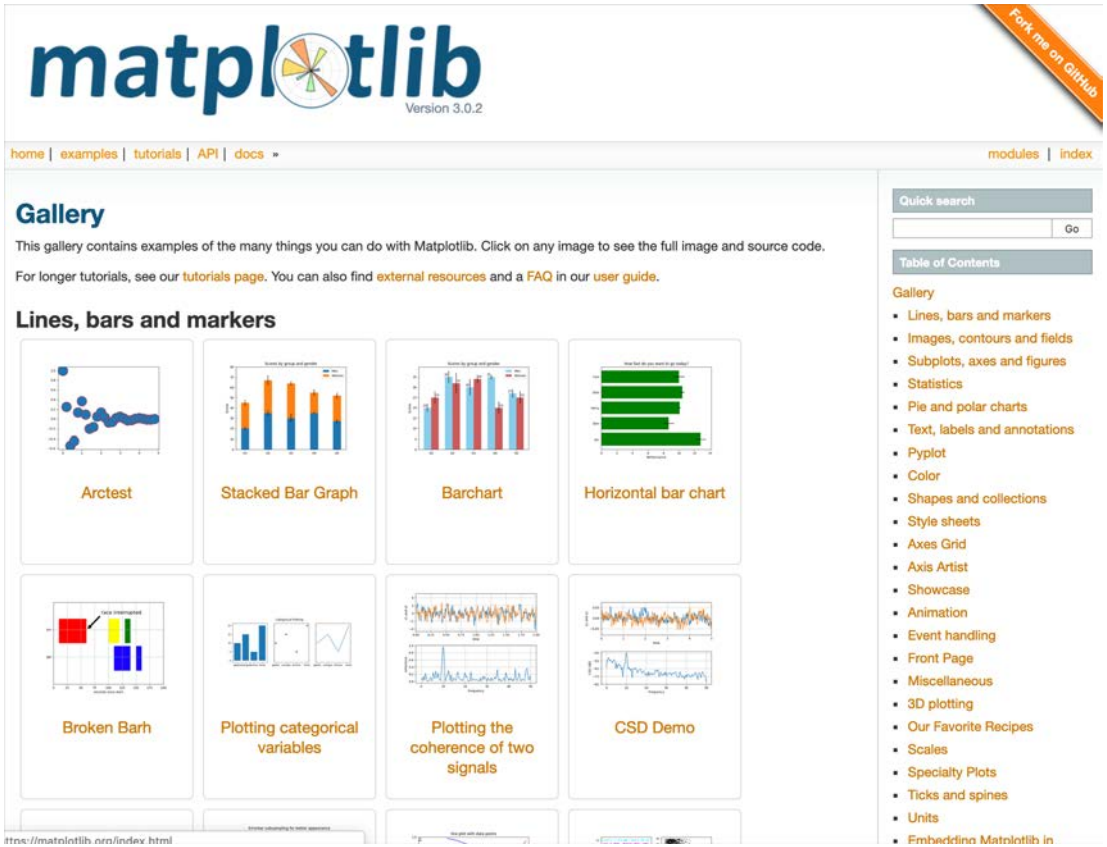
Finally we merge the image and the layer together and return the result.

Then you can use it like this.

```
1   from PIL import Image
2
3   def watermark(im, mark, position):
4       layer = Image.new("RGBA", im.size, (0,0,0,0))
5       layer.paste(mark, position)
6       return Image.composite(layer, im, layer)
7
8
9   im = Image.open("Day2Resource\\img\\clungup.jpg")
10  mark = Image.open("Day2Resource\\watermark.png")
11  mark = mark.resize((100,100))
12
13  out = watermark(im, mark, (0,50))
14  out.show()
```

Data Visualization – charting with matplotlib

- Install matplotlib
- Full documentation: https://matplotlib.org/

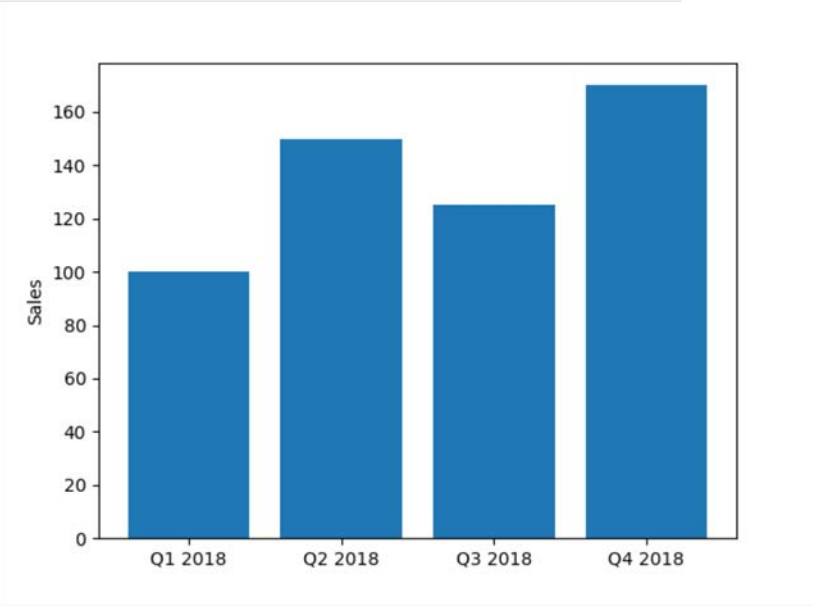


https://matplotlib.org/gallery/index.html

Data Visualization – charting with matplotlib

- Install matplotlib
- Prepare data
- Create bar graph
- Display the chart

```
1   import matplotlib.pyplot as plt
2
3   #set up values
4   VALUES = [100,150,125,170]
5   POS = [0,1,2,3]
6   LABELS = ['Q1 2018','Q2 2018','Q3 2018','Q4 2018']
7
8   #set up the chart
9   plt.bar(POS,VALUES)
10  plt.xticks(POS, LABELS)
11  plt.ylabel('Sales')
12
13  #to display the chart
14  plt.show()
```

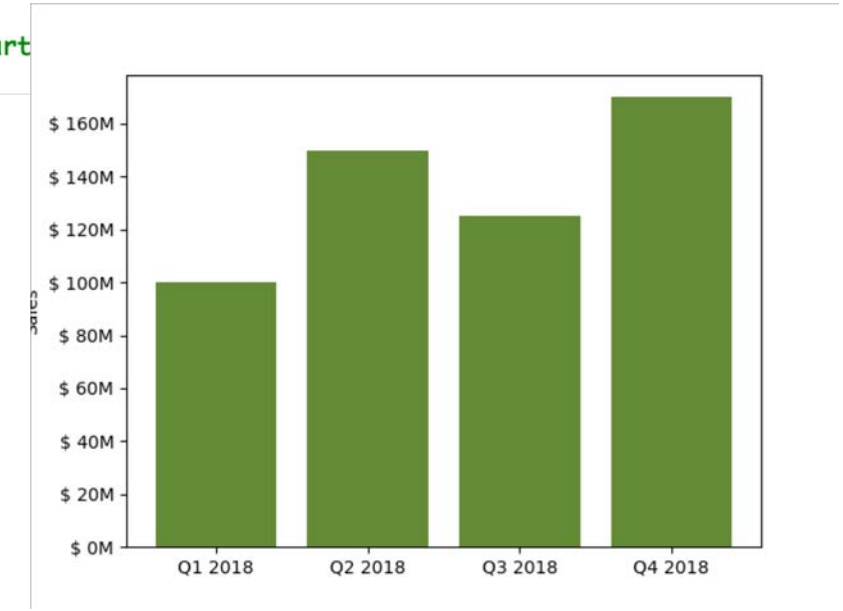


https://matplotlib.org/api/_as_gen/matplotlib.pyplot.bar.html

Data Visualization – charting with matplotlib

- Install matplotlib
- Prepare data
- Customise graph options
- Create bar graph
- Display the chart

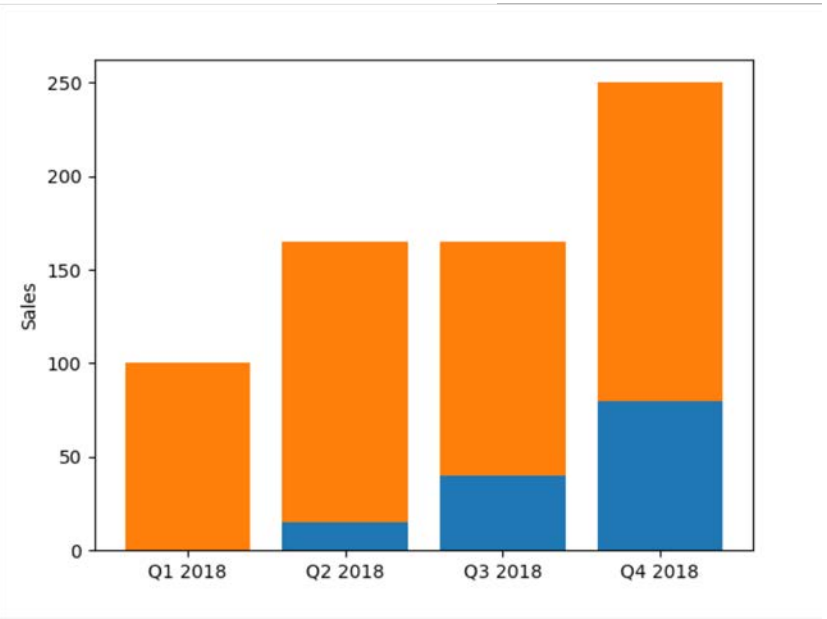
```python
import matplotlib.pyplot as plt
from matplotlib.ticker import FuncFormatter

def value_format(value, position):
        return '$ {}M'.format(int(value))

# set up values
VALUES = [100,150,125,170]
POS = [0,1,2,3]
LABELS = ['Q1 2018','Q2 2018','Q3 2018','Q4 2018']

# set up the chart
# Colors can be specified in multiple formats, as
# described in https://matplotlib.org/api/colors_api.html
# https://xkcd.com/color/rgb/
plt.bar(POS,VALUES, color='xkcd:moss green')
plt.xticks(POS, LABELS)
plt.ylabel('Sales')

# retreive the current axes and apply formatter
axes = plt.gca()
axes.yaxis.set_major_formatter(FuncFormatter(value_format))

# to display the chart
plt.show()
```



Data Visualization – charting with matplotlib

- Stacked bars

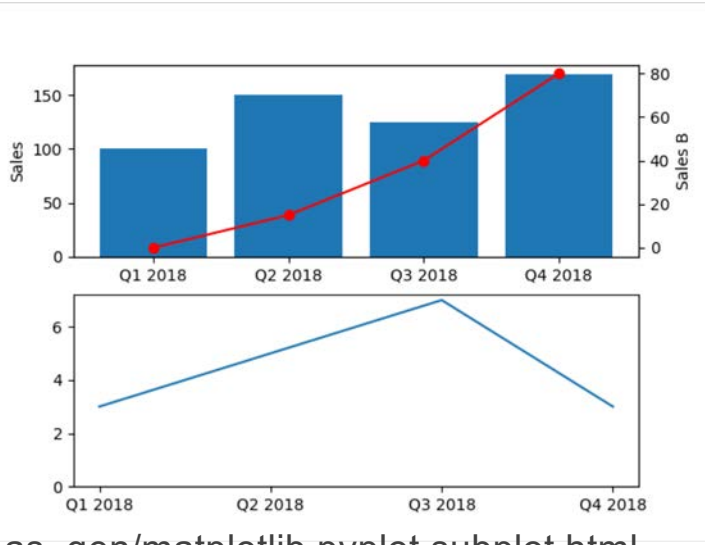
```
1   import matplotlib.pyplot as plt
2
3   #set up values
4   VALUESA = [100,150,125,170]
5   VALUESB = [0,15,40,80]
6   POS = [0,1,2,3]
7   LABELS = ['Q1 2018','Q2 2018','Q3 2018','Q4 2018']
8
9   #set up the first bar
10  plt.bar(POS,VALUESB)
11  #set up the stacked bars
12  plt.bar(POS,VALUESA,bottom=VALUESB)
13
14  plt.ylabel('Sales')
15  plt.xticks(POS, LABELS)
16
17  #to display the chart
18  plt.show()
19
```



Data Visualization – charting with matplotlib

- Stacked bars

```
1  import matplotlib.pyplot as plt
2
3  #set up values
4  VALUESA = [100,150,125,170]
5  VALUESB = [0,15,40,80]
6  VALUESC = [3,5,7,3]
7  POS = [0,1,2,3]
8  LABELS = ['Q1 2018','Q2 2018','Q3 2018','Q4 2018']
9
10 # Create the first plot
11 plt.subplot(2,1,1)
12
13 #creata a bar graph with informaton about VALUESA
14 plt.bar(POS,VALUESA)
15 plt.ylabel('Sales')
16
17 #create a different Y axis, and add information
18 #about VALUESB as a line plot
19 plt.twinx()
20 plt.plot(POS,VALUESB,'o-',color='red')
21 plt.xticks(POS, LABELS)
22 plt.ylabel('Sales B')
23 plt.xticks(POS, LABELS)
24
25 #create another subplot and fill it iwth VALUESC
26 plt.subplot(2,1,2)
27 plt.plot(POS, VALUESC)
28 plt.gca().set_ylim(bottom=0)
29 plt.xticks(POS,LABELS)
30
31 plt.show()
```

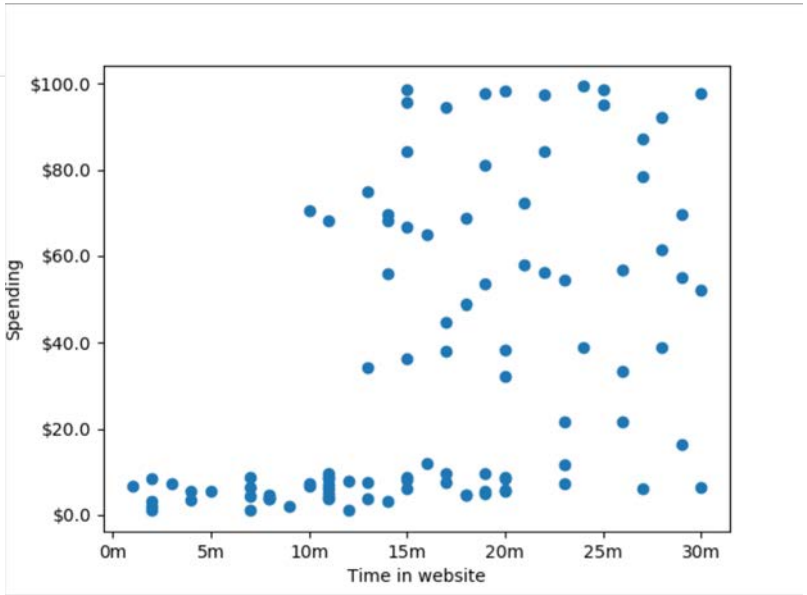


https://matplotlib.org/api/_as_gen/matplotlib.pyplot.subplot.html

Data Visualization – scatter plot

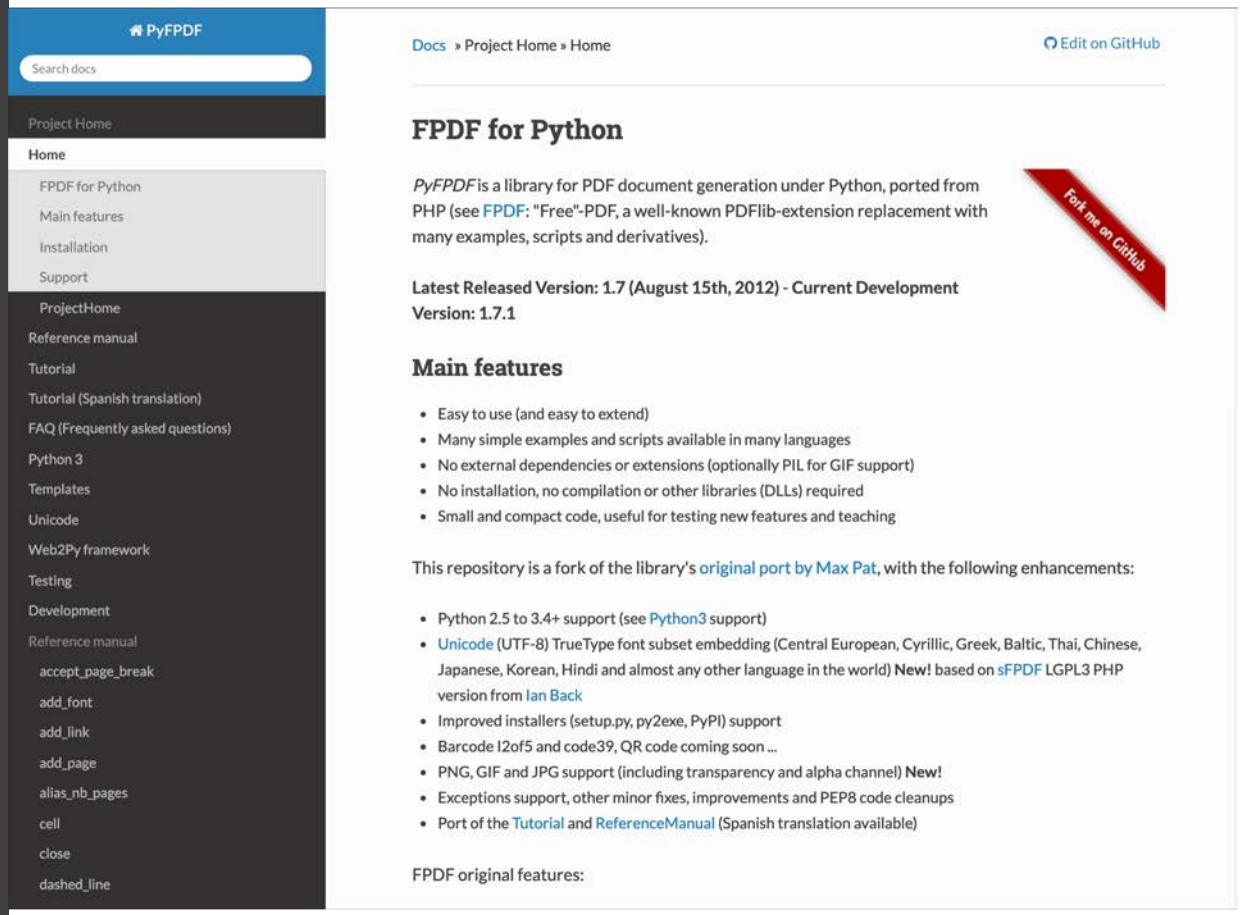
- To save a plot: plt.savefig(*filename*)
- Save the plot before you display.

```
1  import csv
2  import matplotlib.pyplot as plt
3  from matplotlib.ticker import FuncFormatter
4
5  def format_minutes(value, pos):
6          return '{}m'.format(int(value))
7
8  def format_dollars(value, pos):
9          return '${}'.format(value)
10
11 # read data from csv
12 with open('scatter.csv') as fp:
13         reader = csv.reader(fp)
14         data = list(reader)
15
16 data_x = [float(x) for x, y, in data]
17 data_y = [float(y) for x, y in data]
18 plt.scatter(data_x, data_y)
19
20 plt.gca().xaxis.set_major_formatter(FuncFormatter(format_minutes))
21 plt.xlabel('Time in website')
22 plt.gca().yaxis.set_major_formatter(FuncFormatter(format_dollars))
23 plt.ylabel('Spending')
24
25 plt.show()
```



PDF

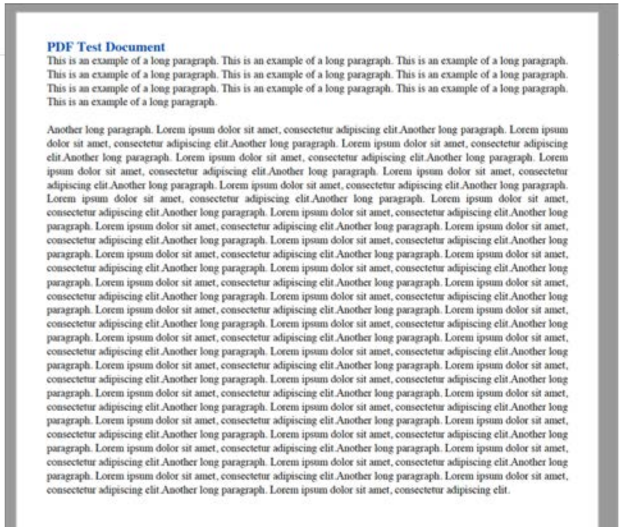
- Install fpdf
  - pip install fpdf



PDF

- Import fpdf
- Create a new pdf document
- Add page
- Add text, logo
- Save file

```python
import fpdf

#create a new pdf
document = fpdf.FPDF()

#define font and color for title and add the first page
document.set_font("Times","B", 14)
document.set_text_color(19,83,173)
document.add_page()

#write the title of the document
document.cell(0,5,"PDF Test Document")
document.ln()

#write a long paragraph
document.set_font("Times", "", 11)
document.set_text_color(0)
document.multi_cell(0,5, "This is an example of a long paragraph. " * 10)
document.ln()

#write another long paragrahp
document.multi_cell(0,5, "Another long paragraph. \
Lorem ipsum dolor sit amet, consectetur adipiscing elit." * 40)

#save the document
document.output("pdf_report.pdf")
```


PDF Test Document

This is an example of a long paragraph. This is an example of a long paragraph. This is an example of a long paragraph. This is an example of a long paragraph. This is an example of a long paragraph. This is an example of a long paragraph. This is an example of a long paragraph. This is an example of a long paragraph. This is an example of a long paragraph. This is an example of a long paragraph.

Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.Another long paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit.

PDF – adding images

- Import fpdf
- Create a new pdf document
- Add page
- Add text, logo
- Save file

```python
import fpdf

#create a new pdf
document = fpdf.FPDF()

#define font and color for title and add the first page
document.set_font("Times","B", 14)
document.set_text_color(19,83,173)
document.add_page()

#add a image
document.image("rp_logo.png", x=10, y=8, w=23)
document.set_y(30);

#write the title of the document
document.cell(0,5,"PDF Test Document")
document.ln()

#write a long paragraph
document.set_font("Times", "", 11)
document.set_text_color(0)
document.multi_cell(0,5, "This is an example of a long paragraph. " * 10)
document.ln()

#write another long paragrahp
document.multi_cell(0,5, "Another long paragraph. \
Lorem ipsum dolor sit amet, consectetur adipiscing elit." * 40)

#add another image
document.image("rp_logo.png", w=23)

#save the document
document.output("pdf_report.pdf")
```

https://pyfpdf.readthedocs.io/en/latest/reference/image/index.html

PDF – adding password

- pip install PyPDF2

```
import fpdf
import PyPDF2

#create a new pdf
document = fpdf.FPDF()

#define font and color for title and add the first page
document.set_font("Times","B", 14)
document.set_text_color(19,83,173)
document.add_page()

#add a image
document.image("rp_logo.png", x=10, y=8, w=23)
document.set_y(30);

#write the title of the document
document.cell(0,5,"PDF Test Document")
document.ln()

#write a long paragraph
document.set_font("Times", "", 11)
document.set_text_color(0)
document.multi_cell(0,5, "This is an example of a long paragraph. " * 10)
document.ln()

#save the document
document.output("pdf_report_before_pw.pdf")

#save the document into a new password protected/encrypted pdf
pdffile = open(r"pdf_report_before_pw.pdf", "rb")
pdfReader = PyPDF2.PdfFileReader(pdffile)
pdfWriter = PyPDF2.PdfFileWriter()
for pageNum in range(pdfReader.numPages):
    pdfWriter.addPage(pdfReader.getPage(pageNum))

pdfWriter.encrypt('123')
resultPDF = open(r"pdf_report_after_pw.pdf", "wb")
pdfWriter.write(resultPDF)
resultPDF.close()
pdffile.close()
```

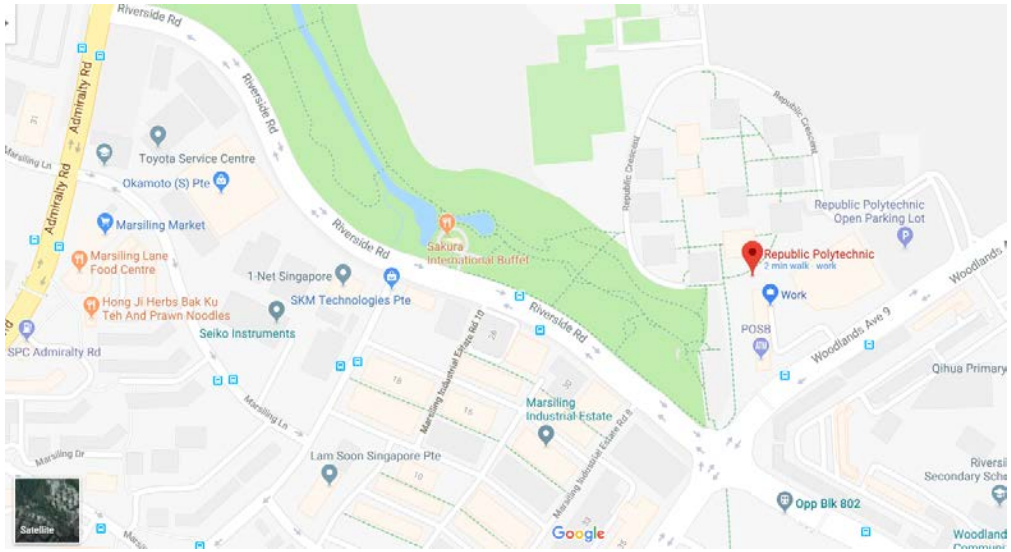
https://pythonhosted.org/PyPDF2/

Connecting to the Web

- webbrowser – opens a browser to a specific page
- requests – download files and web pages from the Web
- Beautiful Soup – a third party module that parses HTML

webbrowser.open() opens a browser to a specific page

```
1  #! python3
2
3  import webbrowser
4
5  url = "https://www.google.com.sg/maps/"
6  webbrowser.open(url)
7
```

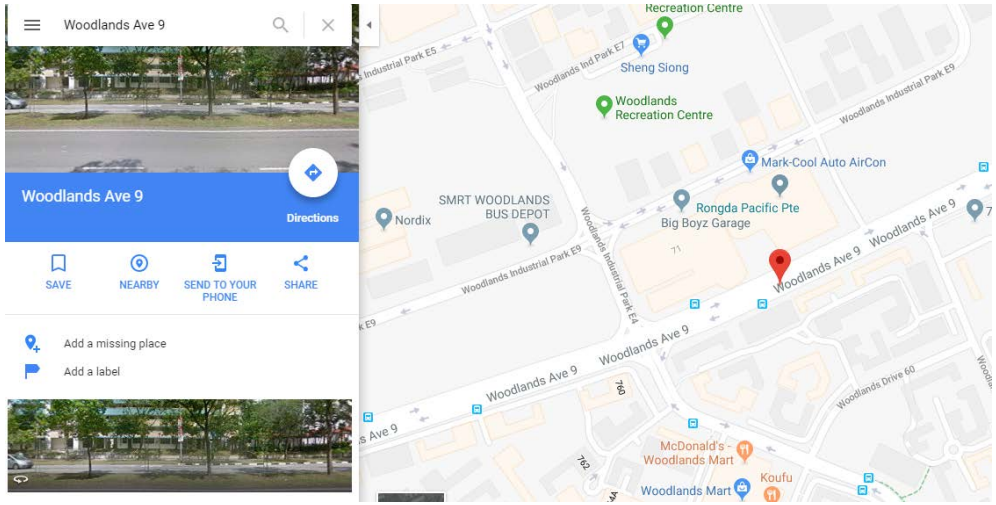


Connecting to the Web

webbrowser.open() opens a browser to a specific page

```
1  #! python3
2
3  import webbrowser
4
5  url = "https://www.google.com.sg/maps/"
6  address = input('Enter Address: ')
7  webbrowser.open(url + "place/" + address)
```

```
C:\Users\denise_quek\AppData\Local\P
Enter Address: Woodlands Ave 9
```



Connecting to the Web

- requests – download files and web pages from the Web
- **Install requests module**

Get the required information from the given URL

```
1  import requests
2
3  url = "https://api.data.gov.sg/v1/environment/2-hour-weather-forecast"
4  req = requests.get(url)
5  print(req.text)
```

Connecting to the Web

- Use requests.get() to get web content from specified URL
- Use raise_for_status() to ensure that download is successful before we continue
- Call open() with "wb" to create a new file in write binary mode
- Loop over the Response object using iter_content()
- Call write() on each iteration to write the content to the file
- Remember to close the file

```
1   import requests
2
3   url = "https://api.data.gov.sg/v1/environment/2-hour-weather-forecast"
4   req = requests.get(url)
5
6   try:
7       req.raise_for_status()
8
9       playFile = open("downloadedFile.txt", 'wb')
10      for chunk in req.iter_content(100000):
11          print(chunk)
12          playFile.write(chunk)
13      playFile.close()
14
15  except Exception as e:
16      print("There was a problem: %s" % (e))
17
```

Connecting to the Web

- File will be saved in "downloadedFile.txt“ (in the same folder as your program)

```
1   import requests
2
3   url = "https://api.data.gov.sg/v1/environment/2-hour-weather-forecast"
4   req = requests.get(url)
5
6   try:
7       req.raise_for_status()
8
9       playFile = open("downloadedFile.txt", 'wb')
10      for chunk in req.iter_content(100000):
11          print(chunk)
12          playFile.write(chunk)
13      playFile.close()
14
15  except Exception as e:
16      print("There was a problem: %s" % (e))
17
```

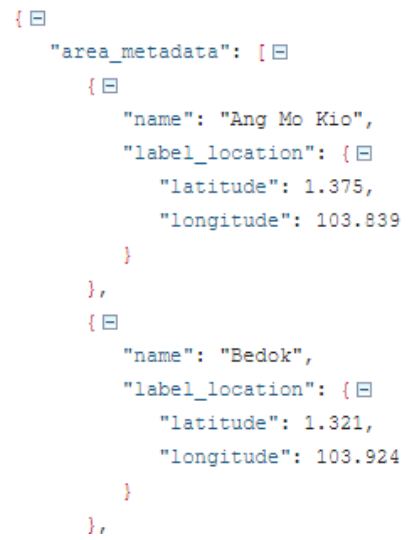
downloadedFile.txt

```
1   {"area_metadata":[{"name":"Ang Mo
    Kio","label_location":{"latitude":1.375,"
    longitude":103.839}},{"name":"Bedok","lab
    el_location":{"latitude":1.321,"longitude
    ":103.924}},{"name":"Bishan","label_locat
```

Connecting to the Web

- Data is in JSON format
- Use a JSON formatter tool to present the data in a nicer form

```
{"area_metadata":[{"name":"Ang Mo Kio",
"label_location":{"latitude":1.375,"longitude":
103.839}},{"name":"Bedok","label_location":{
"latitude":1.321,"longitude":103.924}},{"name":
"Bishan","label_location":{"latitude":1.350772,
"longitude":103.839}},{"name":"Boon Lay",
"label_location":{"latitude":1.304,"longitude":
103.701}},{"name":"Bukit Batok",
```




```
1  import requests
2
3  url = "https://api.data.gov.sg/v1/environment/2-hour-weather-forecast"
4  req = requests.get(url)
5  print(req.text)
```

Connecting to the Web

- To work with JSON data, import json first
- Use json.loads() to load the data in JSON format
- Extract and retrieve the required data

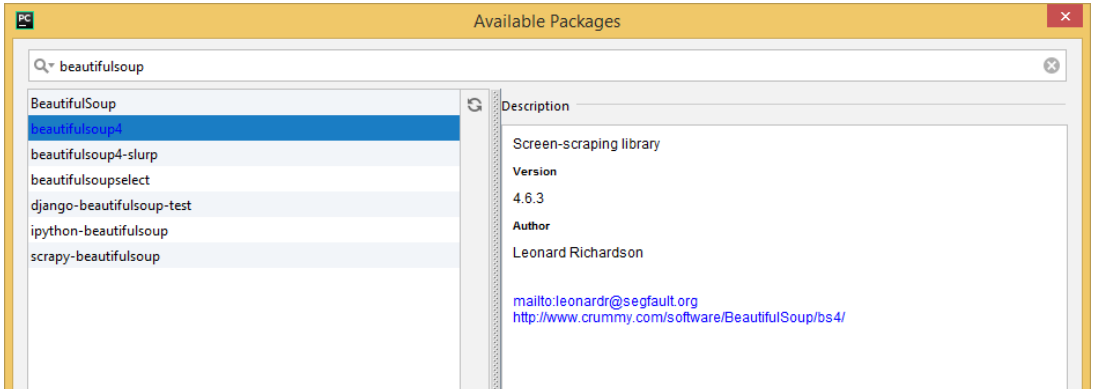
```python
import json
import requests

url = "https://api.data.gov.sg/v1/environment/2-hour-weather-forecast"
req = requests.get(url)

data = json.loads(req.text)

forecasts = data["items"][0]["forecasts"]

for forecast in forecasts:
    area = forecast["area"]
    weather = forecast["forecast"]
    print(area + ": " + weather)
```

```
C:\Users\denise_quek\AppData\Local\Programs\Python\Py
Ang Mo Kio: Thundery Showers
Bedok: Thundery Showers
Bishan: Heavy Thundery Showers with Gusty Winds
Boon Lay: Heavy Thundery Showers with Gusty Winds
Bukit Batok: Heavy Thundery Showers with Gusty Winds
Bukit Merah: Heavy Thundery Showers with Gusty Winds
```

Connecting to the Web

- Beautiful Soup – a third party module that parses HTML (web pages)
- Install Beautiful Soup 4

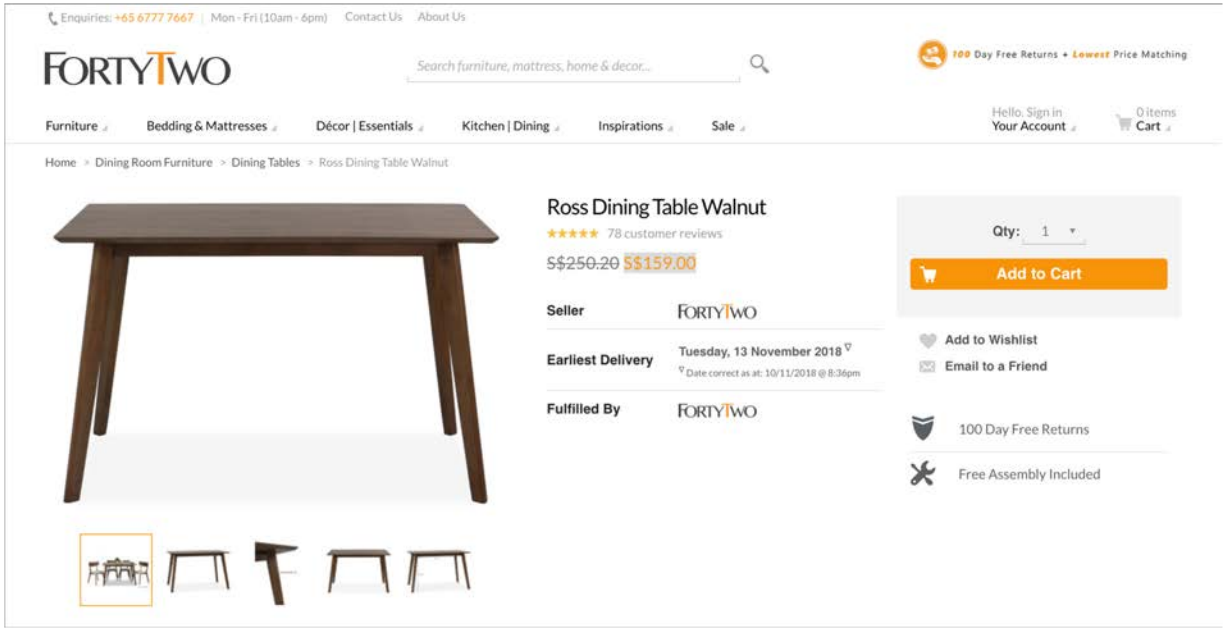
Web Scraping – download and process Web content



Connecting to the Web

- Get the url

https://www.fortytwo.sg/dining/dining-tables/ross-dining-table-walnut.html

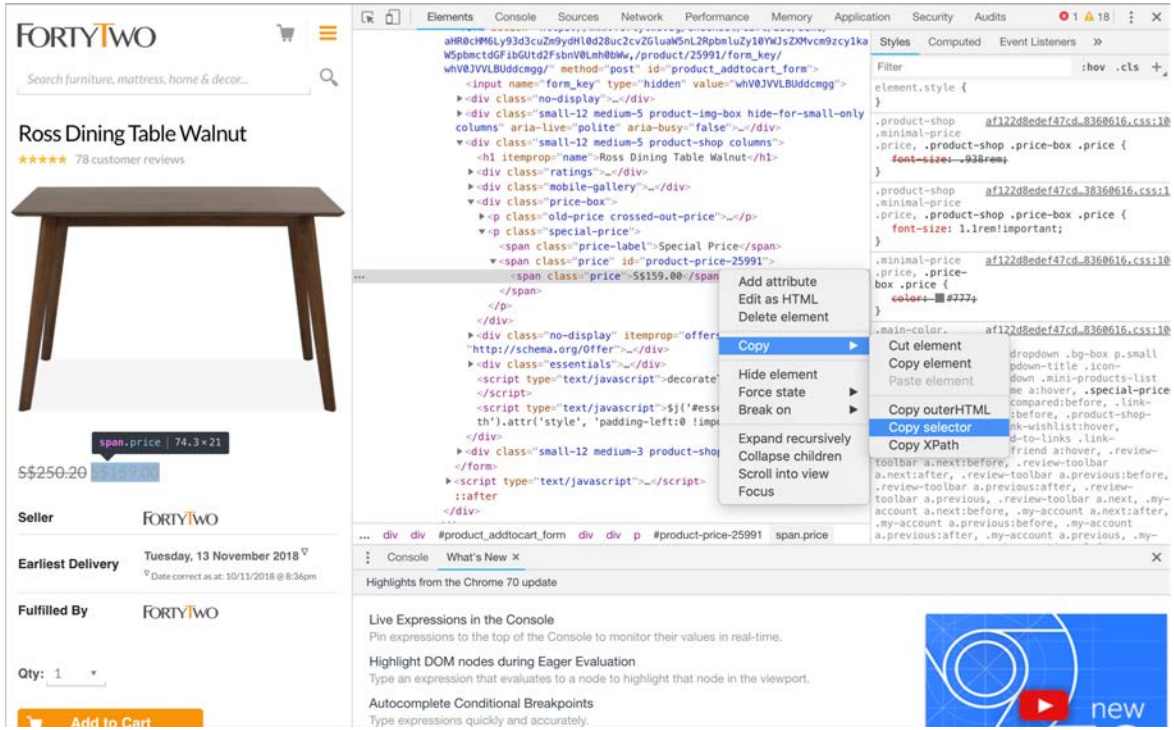


Connecting to the Web

- Get the url

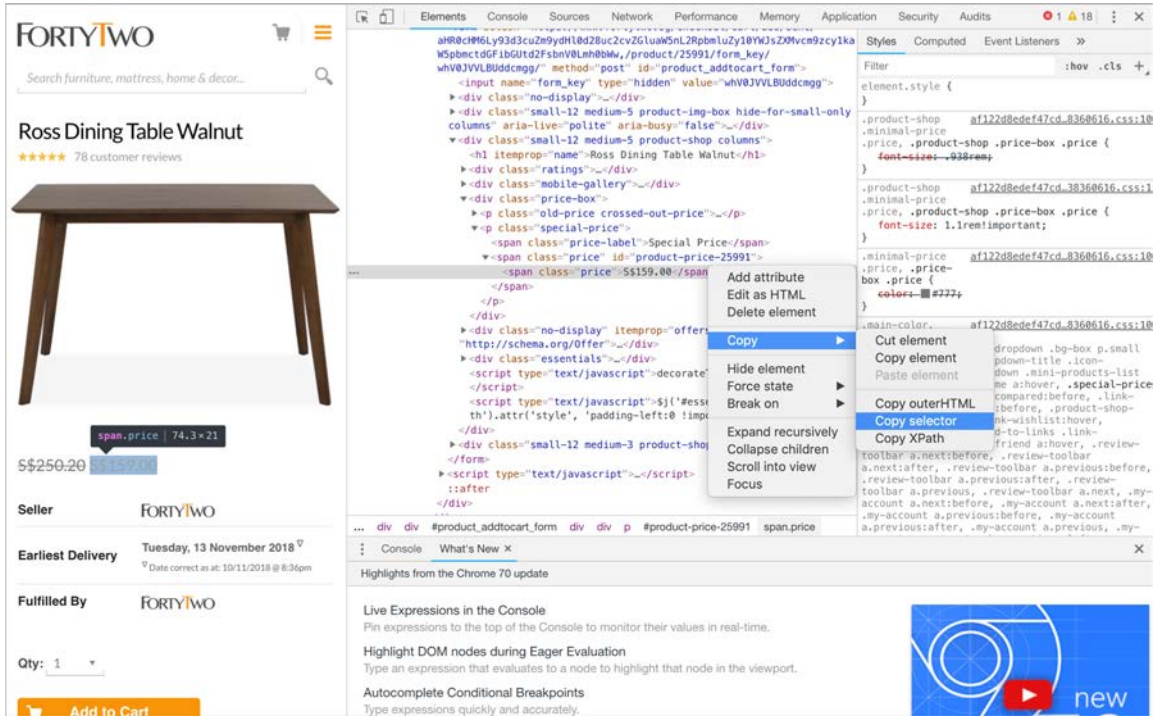
https://www.fortytwo.sg/dining/dining-tables/ross-dining-table-walnut.html

- Select the element to extract, right-click "Inspect"
- Right-click "Copy" → "Copy selector



Connecting to the Web

- Get the url
- Select the element to extract, right-click "Inspect"
- Right-click "Copy" → "Copy selector"

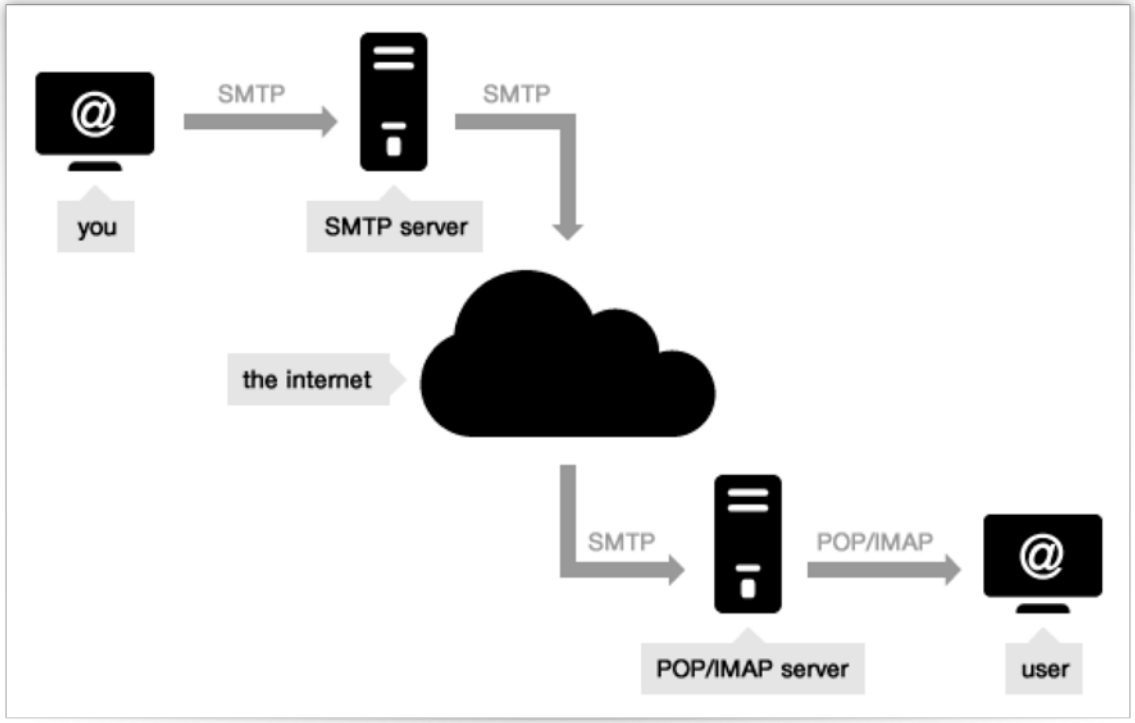



```
import bs4
import requests

requestObj = requests.get("https://www.fortytwo.sg/dining/dining-tables/ross-dining-table-walnut.html")
requestObj.raise_for_status()
soup = bs4.BeautifulSoup(requestObj.text, 'html.parser')
elements = soup.select("#product-price-25991")
print(elements[0].text)
```

```
C:\Users\kwseow\PycharmProjects\PSA
S$159.00

Process finished with exit code 0
```

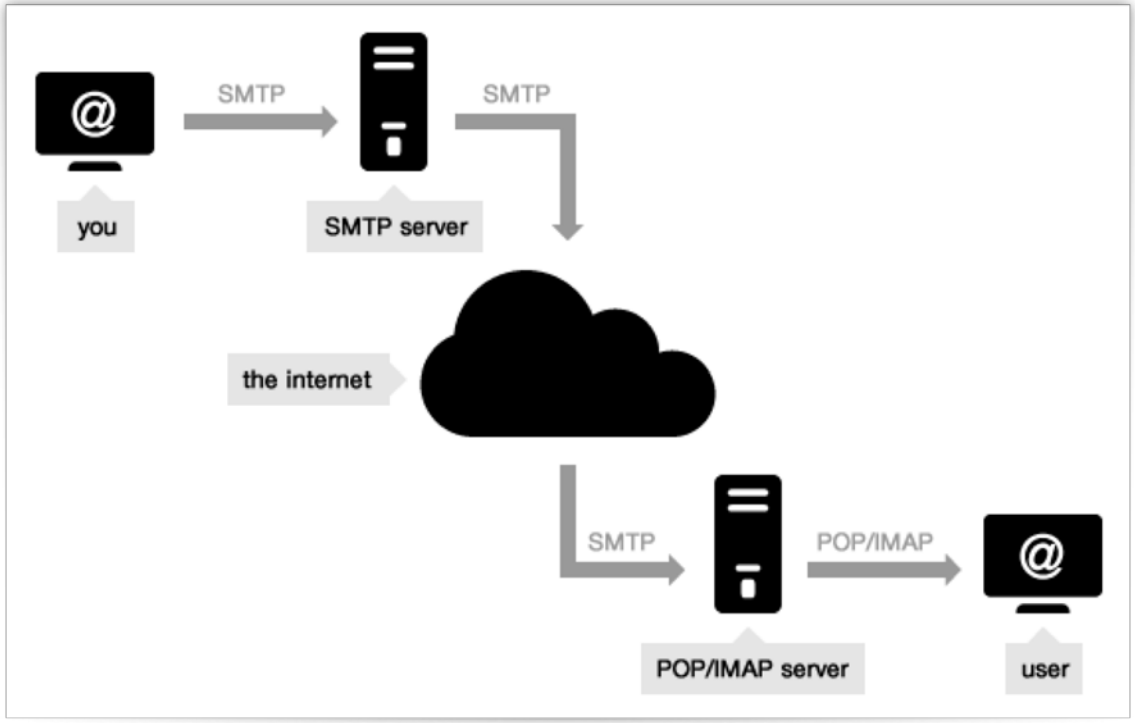
Sending Email

- SMTP (Simple Mail Transfer Protocol) is used for sending and delivering from a client to a server via port 25: it's the **outgoing server**.
- IMAP and POP are two methods to access email. IMAP is the recommended method when you need to check your emails from several different devices, such as a phone, laptop, and tablet.



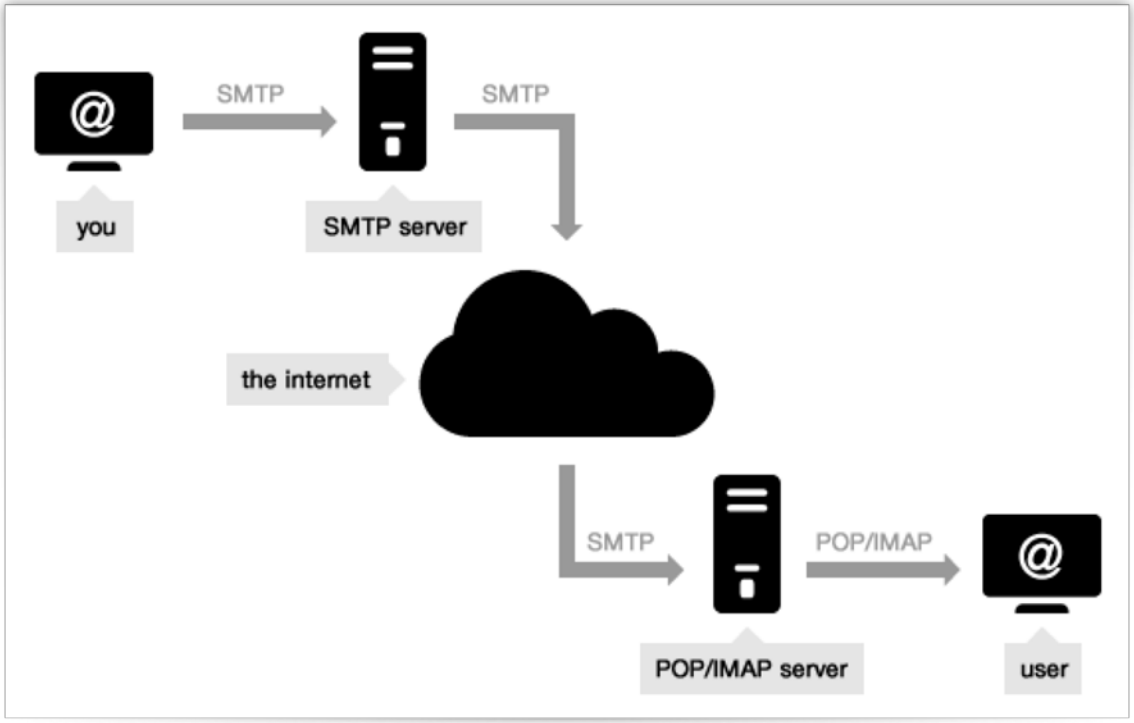
Sending Email

- POP (“Post Office Protocol”) allows the user to pick up the message and download it into his own inbox: it’s the **incoming server**.
- The latest version of the Post Office Protocol is named POP3, and it’s been used since 1996; it uses port 110.



Sending Email

- **Note**: The SMTP servers used when you send your emails- Hotmail, Gmail , Yahoo Mail – are **shared among users**
- Common providers establish some **strict limits** on the number of emails you can send (e.g. Yahoo's restriction is 100 emails per hour).



If you plan to send a bulk email or set up an email campaign you should opt for a professional outgoing email server like turboSMTP, which guarantees a controlled IP and ensure that all your messages reach their destination.

https://serversmtp.com/what-is-smtp-server/

Send Email using Gmail

Incoming Mail (IMAP) Server	imap.gmail.com Requires SSL: Yes Port: 993
Outgoing Mail (SMTP) Server	smtp.gmail.com Requires SSL: Yes Requires TLS: Yes (if available) Requires Authentication: Yes Port for SSL: 465 Port for TLS/STARTTLS: 587
Full Name or Display Name	Your name
Account Name, User name, or Email address	Your full email address
Password	Your Gmail password

Send Email using Gmail

- Import smtplib module
- Specify Gmail email & password, receiver's email address, email title & content
- Connect to SMTP server using Port 587
- Call starttls() to enable encryption for your connection
- Login using email and password
- Call sendmail()
- Call quit() to disconnect from the SMTP server

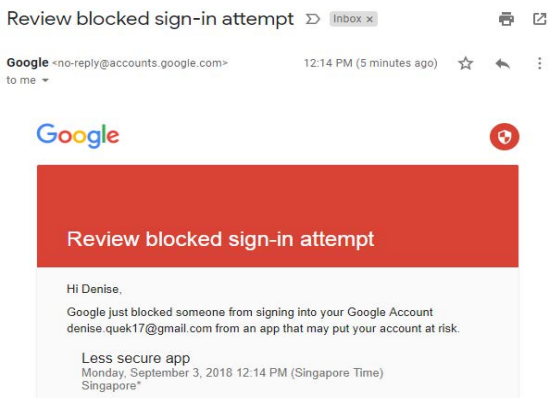
```
import smtplib

sender_email_address = "your_email_address@gmail.com"
sender_email_password = "xxxxxxxxxxxxxxx"
receiver_email_address = "another_email_address@gmail.com"
email_title_content = "Subject: Sending Email Using Python\nThis is a test email."


email_title_content = "Subject: Sending Email Using Python\nThis is a test email."
```

➢The start of the email body must begin with "Subject: " for the subject line. The "\n" newline character separates the subject line from the main body content.

```
print("Trying to connect to Gmail SMTP server")
smtpObj = smtplib.SMTP("smtp.gmail.com", 587)
smtpObj.starttls()

print("Connected. Logging in...")
smtpObj.login(sender_email_address, sender_email_password)

smtpObj.sendmail(sender_email_address, receiver_email_address, email_title_content)
print("Email sent successfully...")

smtpObj.quit()
```

Send Email using Gmail

- Google may block attempted sign-in from unknown devices that don't meet their security standards!




```
C:\Users\denise_quek\AppData\Local\Programs\Python\Python37\python.exe D:/CET_Python/Denise/TestEmail.py
Trying to connect to Gmail SMTP server
Connected. Logging in...
Traceback (most recent call last):
  File "D:/CET_Python/Denise/TestEmail.py", line 13, in <module>
    smtpObj.login(sender_email_address, sender_email_password)
  File "C:\Users\denise_quek\AppData\Local\Programs\Python\Python37\lib\smtplib.py", line 730, in login
    raise last_exception
  File "C:\Users\denise_quek\AppData\Local\Programs\Python\Python37\lib\smtplib.py", line 721, in login
    initial_response_ok=initial_response_ok)
  File "C:\Users\denise_quek\AppData\Local\Programs\Python\Python37\lib\smtplib.py", line 642, in auth
    raise SMTPAuthenticationError(code, resp)
smtplib.SMTPAuthenticationError: (534, b'5.7.9 Application-specific password required. Learn more at\n5.7.9

Process finished with exit code 1
```

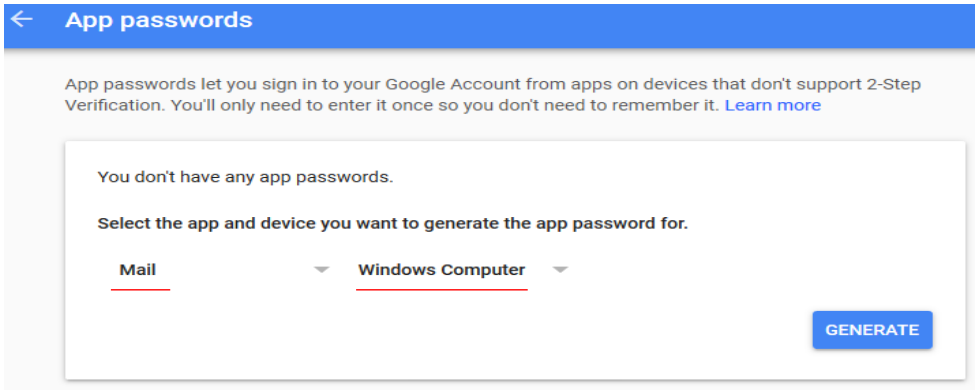
Send Email using Gmail

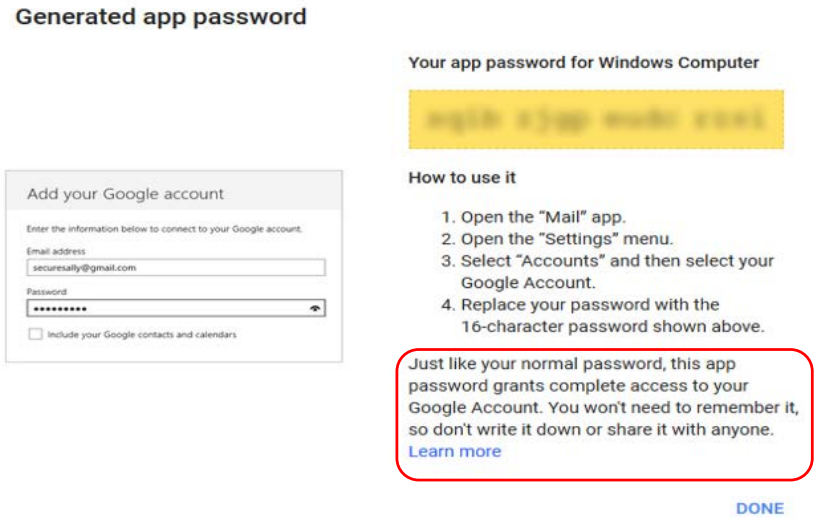
Steps To Create Google App Password

Step 1: Login to Gmail. Go to Account → Signing in to Google

Step 2: Make sure that 2-Step Verification is on

Step 3: Create an App password





https://support.google.com/accounts/answer/185833?hl=en

Send Email using Gmail

- Replace your actual password with the App password

```
import smtplib

sender_email_address = "your_email_address@gmail.com"
sender_email_password = "xxxxxxxxxxxxxxx"
receiver_email_address = "another_email_address@gmail.com"
email_title_content = "Subject: Sending Email Using Python\nThis is a test email."
```

- Run your email program

```
C:\Users\denise_quek\AppData\Local\Programs\Python\Python37\python.exe D:/CET_Python/Denise/TestEmail.py
Trying to connect to Gmail SMTP server
Connected. Logging in...
Email sent successfully...

Process finished with exit code 0
```

Send Email using Gmail

- Send email to students who were absent

	A	B	C
1	**Student**	**Email**	**Status**
2	Alicia	code.musically@gmail.com	Present
3	Bryan	code.musically@gmail.com	Present
4	Carol	code.musically@gmail.com	Absent
5	David	code.musically@gmail.com	Absent
6	Evelyn	code.musically@gmail.com	Present
7			

Sheet1

```
#! python3

import openpyxl, smtplib

def sendEmail(name, emailTo):
    email_body = "Subject: Your attendance. \nDear %s, \nYou were absent for class.\n" %(name)

    smtpObj = smtplib.SMTP("smtp.gmail.com", 587)
    smtpObj.starttls()
    smtpObj.login("code.musically@gmail.com", "xxxxxxxxxxx")
    smtpObj.sendmail('code.musically@gmail.com', emailTo, email_body)

    smtpObj.quit()
```

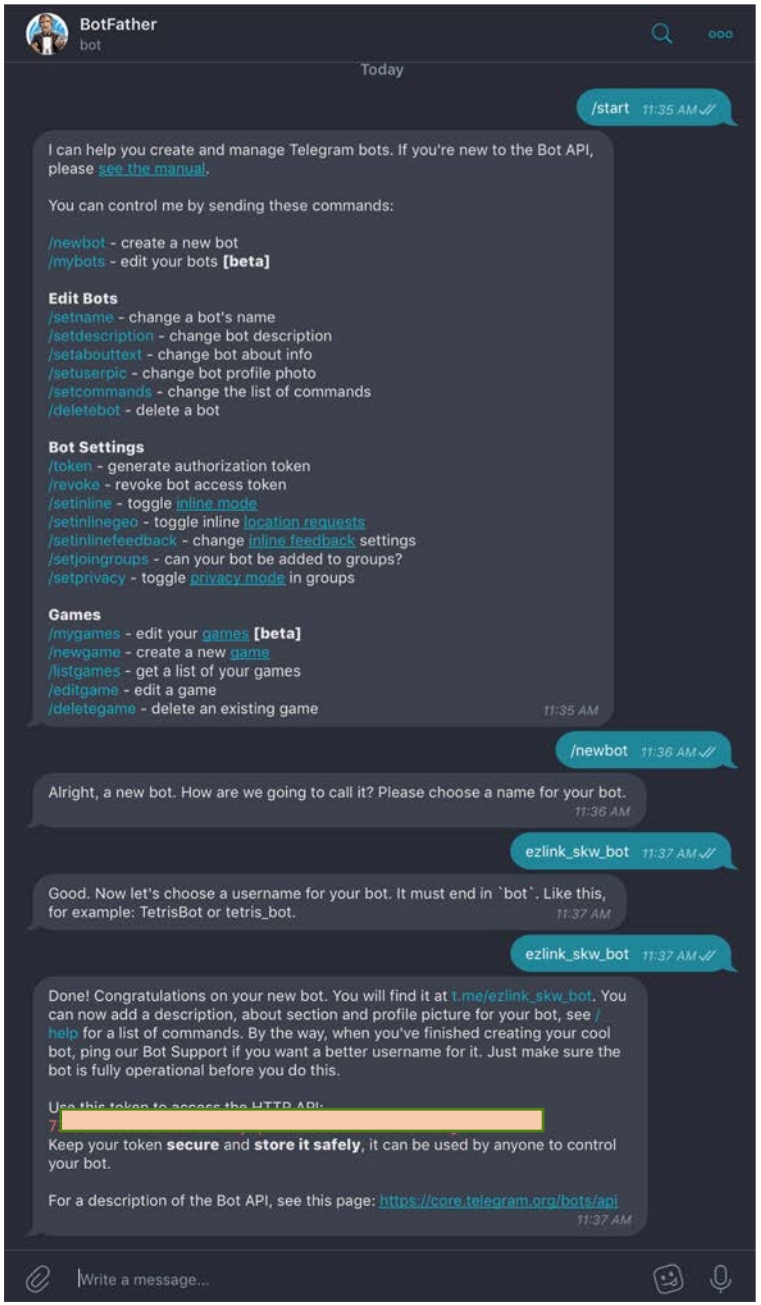
Send Email using Gmail

- Send email to students who were absent

```
workbook = openpyxl.load_workbook("D:\CET_Python\students_attendance.xlsx")
sheet = workbook["Sheet1"]

max_row = sheet.max_row
max_column = sheet.max_column

for i in range(1, max_row+1):

    attendance = sheet.cell(row=i, column=3).value

    if attendance == "Absent":
        name = sheet.cell(row=i, column=1).value
        email = sheet.cell(row=i, column=2).value

        print(name + " is absent.")
        sendEmail(name, email)
        print("Email sent to " + email)
        print()

```

Telegram Bot

- Create a new bot using BotFather: https://telegram.me/botfather
- Run /start to start the interface and then create a new bot with /newbot
- The interface will ask you the name of the bot and a username, which should be unique
- The Telegram channel of your bot— https:/t.me/<yourusername>
- A token to allow access the bot. Copy it as it will be used later



Telegram Bot

- Install telepot
  - pip install telepot
- Update your TOKEN
- Define intent
- Define response

```python
import time
import telepot
from telepot.loop import MessageLoop
from telepot.delegate import per_chat_id, create_open, pave_event_space

TOKEN = '<YOUR TOKEN>'

# Define the information to return per command
def get_help():
    msg = '''
    Use one of the following commands:
        help: To show this help
        offers: To see this week offers
        events: To see this week events
    '''
    return msg


def get_offers():
    msg = '''
    This week enjoy these amazing offers!
        20% discount in beach products
        15% discount if you spend more than S$0
    '''
    return msg


def get_events():
    msg = '''
    Join us for an incredible party the Thursday in our Marina Bay Sands shop!
    '''
    return msg


COMMANDS = {
    'help': get_help,
    'offers': get_offers,
    'events': get_events,
}
```

response

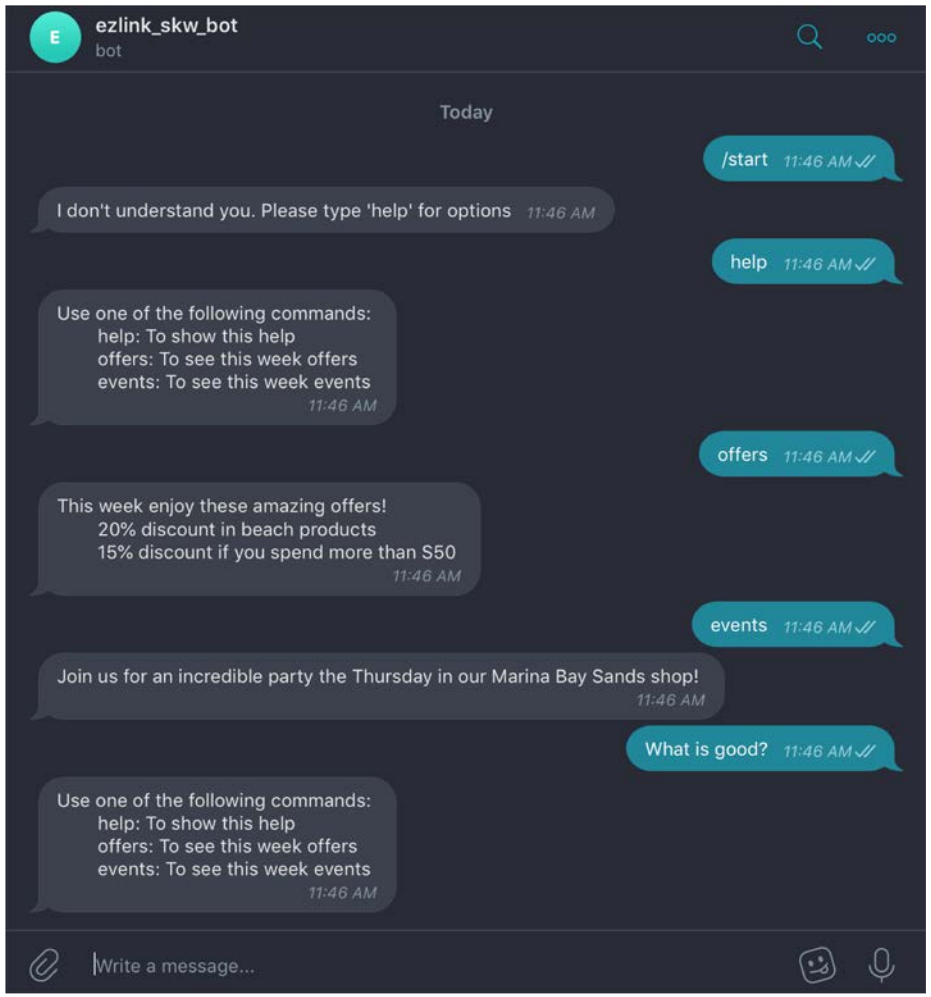
intents

Telegram Bot

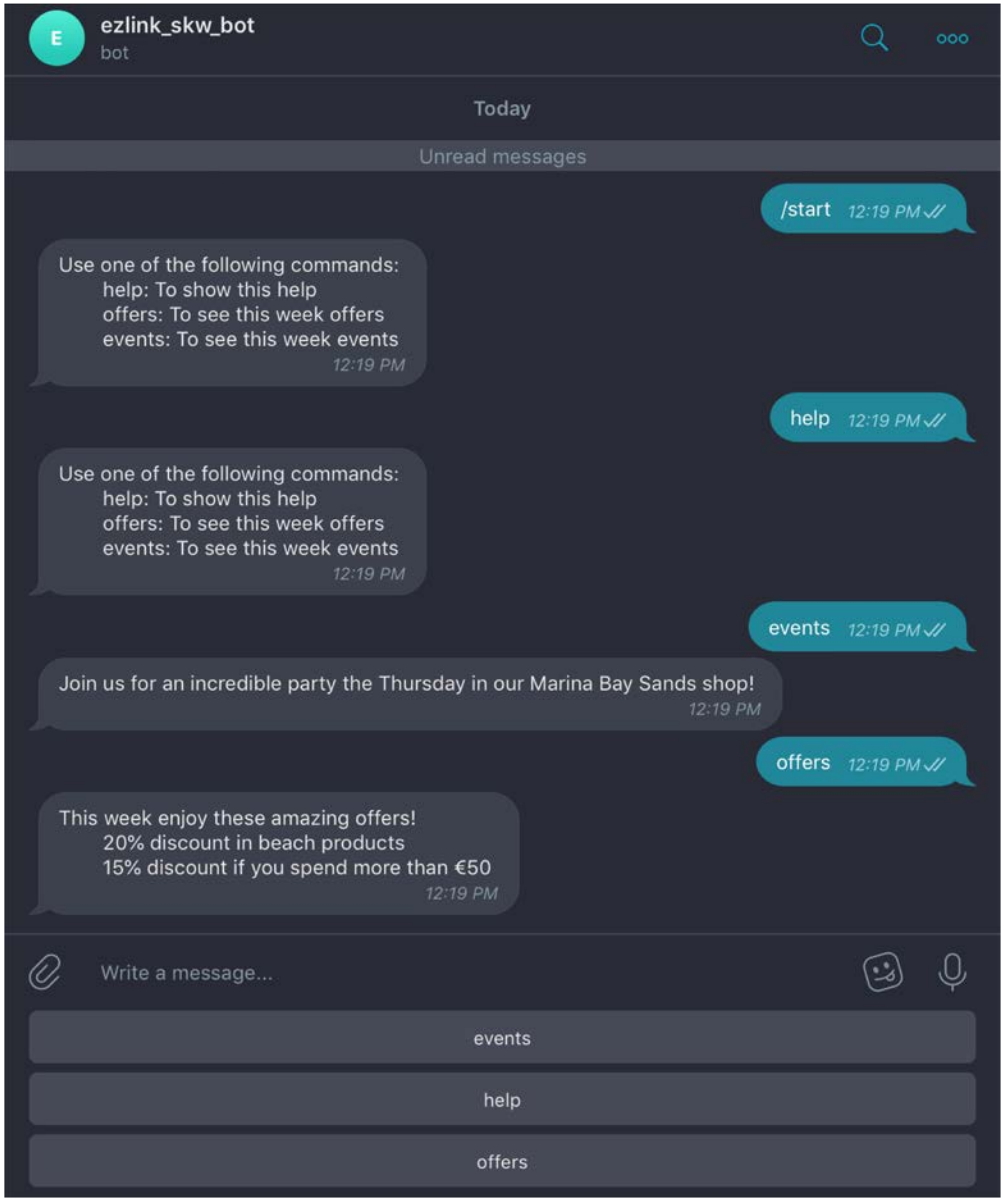

```python
class MarketingBot(telepot.helper.ChatHandler):

    def open(self, initial_msg, seed):
        self.sender.sendMessage(get_help())
        # prevent on_message() from being called on the initial message
        return True

    def on_chat_message(self, msg):
        # If the data sent is not test, return an error
        content_type, chat_type, chat_id = telepot.glance(msg)

        if content_type != 'text':
            self.sender.sendMessage("I don't understand you. "
                                    "Please type 'help' for options")
            return

        # Make the commands case insensitive
        command = msg['text'].lower()
        if command not in COMMANDS:
            self.sender.sendMessage("I don't understand you. "
                                    "Please type 'help' for options")
            return

        message = COMMANDS[command]()
        self.sender.sendMessage(message)

    def on_idle(self, event):
        self.close()

    def on_close(self, event):
        # Add any required cleanup here
        pass


# Create and start the bot
bot = telepot.DelegatorBot(TOKEN, [
    pave_event_space()(
        per_chat_id(), create_open, MarketingBot, timeout=10),
])
MessageLoop(bot).run_as_thread()
print('Listening ...')

while 1:
    time.sleep(10)
```

Process the message

Telegram Bot



Telegram Bot – Custom Keyboard



Telegram Bot – Custom Keyboard

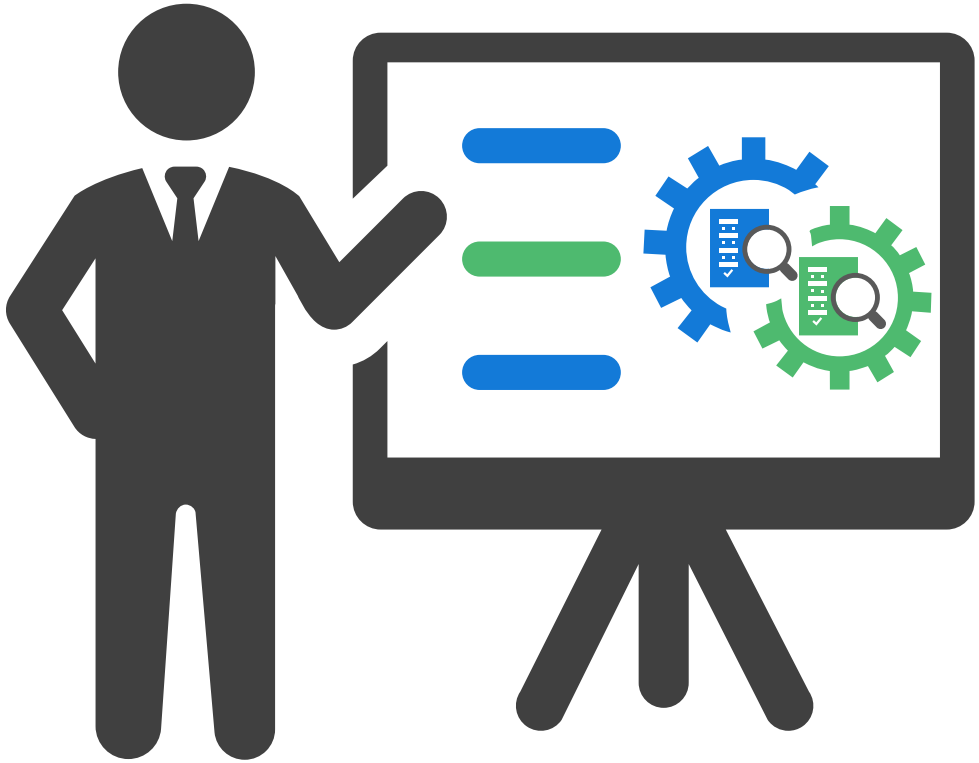
```python
import time
import telepot
from telepot.loop import MessageLoop
from telepot.delegate import per_chat_id, create_open, pave_event_space
from telepot.namedtuple import ReplyKeyboardMarkup, KeyboardButton

#TOKEN = '<YOUR TOKEN>'
TOKEN = '726962401:AAHoiAXriizyEpBds9cJVW3eJHocb01o2ig'


# Define the information to return per command
def get_help():
    msg = '''
    Use one of the following commands:
        help: To show this help
        offers: To see this week offers
        events: To see this week events
    '''
    return msg

def get_offers():
    msg = '''
    This week enjoy these amazing offers!
        20% discount in beach products
        15% discount if you spend more than €50
    '''
    return msg

def get_events():
    msg = '''
    Join us for an incredible party the Thursday in our Marina Bay Sands shop!
    '''
    return msg

COMMANDS = {
    'help': get_help,
    'offers': get_offers,
    'events': get_events,
}

# Create a custom keyboard with only the valid responses
keys = [[KeyboardButton(text=text)] for text in COMMANDS]
KEYBOARD = ReplyKeyboardMarkup(keyboard=keys)
```

Telegram Bot – Custom Keyboard

```
45  class MarketingBot(telepot.helper.ChatHandler):
46
47      def open(self, initial_msg, seed):
48          self.sender.sendMessage(get_help(), reply_markup=KEYBOARD)
49          # prevent on_message() from being called on the initial message
50          return True
51
52      def on_chat_message(self, msg):
53          # If the data sent is not test, return an error
54          content_type, chat_type, chat_id = telepot.glance(msg)
55
56          if content_type != 'text':
57              self.sender.sendMessage("I don't understand you. "
58                                      "Please type 'help' for options",
59                                      reply_markup=KEYBOARD)
60              return
61
62          # Make the commands case insensitive
63          command = msg['text'].lower()
64          if command not in COMMANDS:
65              self.sender.sendMessage("I don't understand you. "
66                                      "Please type 'help' for options",
67                                      reply_markup=KEYBOARD)
68              return
69
70          message = COMMANDS[command]()
71          self.sender.sendMessage(message, reply_markup=KEYBOARD)
72
73      def on__idle(self, event):
74          self.close()
75
76
77  # Create and start the bot
78  bot = telepot.DelegatorBot(TOKEN, [
79      pave_event_space()(
80          per_chat_id(), create_open, MarketingBot, timeout=10),
81  ])
82  MessageLoop(bot).run_as_thread()
83  print('Listening ...')
84
85  while 1:
86      time.sleep(10)
```

PSA UNIVERSITY

Day 2 Summary



- ✓ *Read and write files*
- ✓ *Copying, moving and deleting files and folders*
- ✓ *Working with Excel*
- ✓ *Processing CSV files*
- ✓ *Working with PDF*
- ✓ *Image Processing: loading, scaling, watermark, applying filters*
- ✓ *Generating charts*
- ✓ *Connecting to the web, scrapping*
- ✓ *Sending emails*
- ✓ *Telegram bots*

Email
seow_khee_wei@rp.edu.sg

Telegram
@kwseow

Source code: http://bit.ly/2GVM07s

Where to go from here?

Getting started step by step
http://www.python.org/about/gettingstarted/

Run through the python tutorials:
http://docs.python.org/tutorial/index.html

Keep the API doc under your pillow:
http://docs.python.org/library/index.html

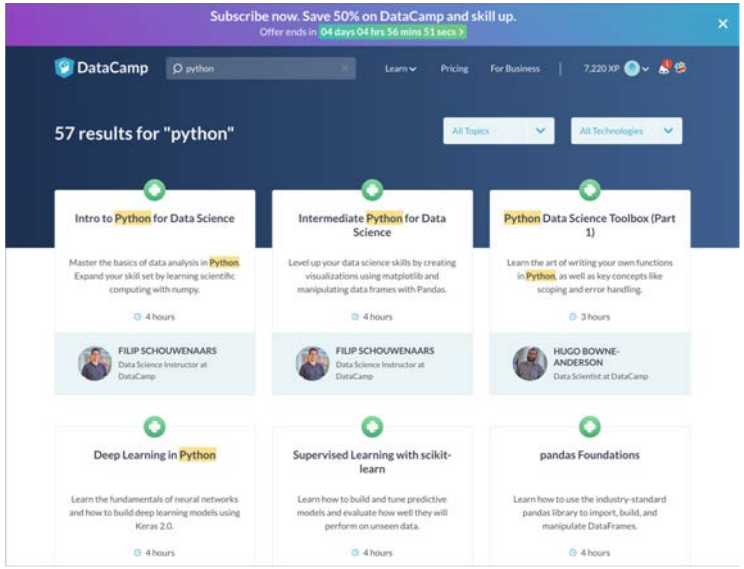
Advanced examples:
http://www.diveintopython.org/toc/index.html

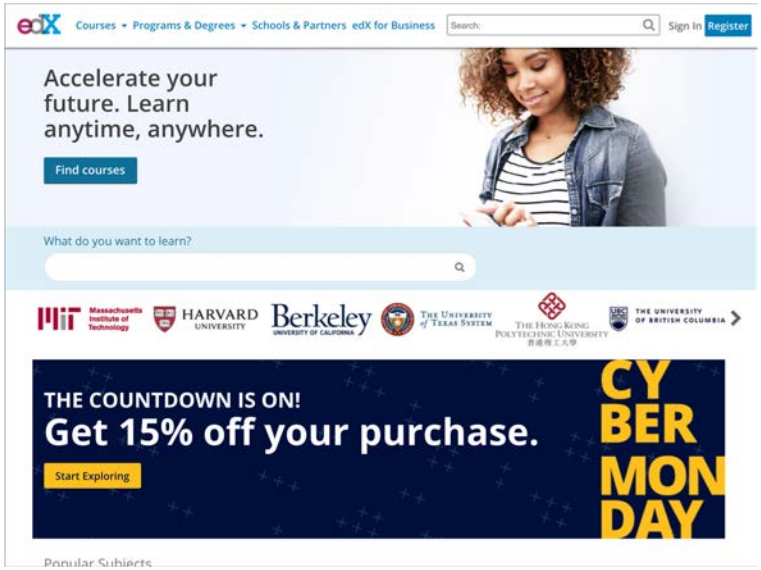
Where to go from here?

MOOC:
DataCamp
https://www.datacamp.com/

Edx
https://www.edx.org/

Udemy (freemium course)
https://t.me/freecourse





Online Evaluation
Fundamentals of Python for Beginners
(7-8 March 2019)

https://tinyurl.com/yb3u4tnv

Thank you