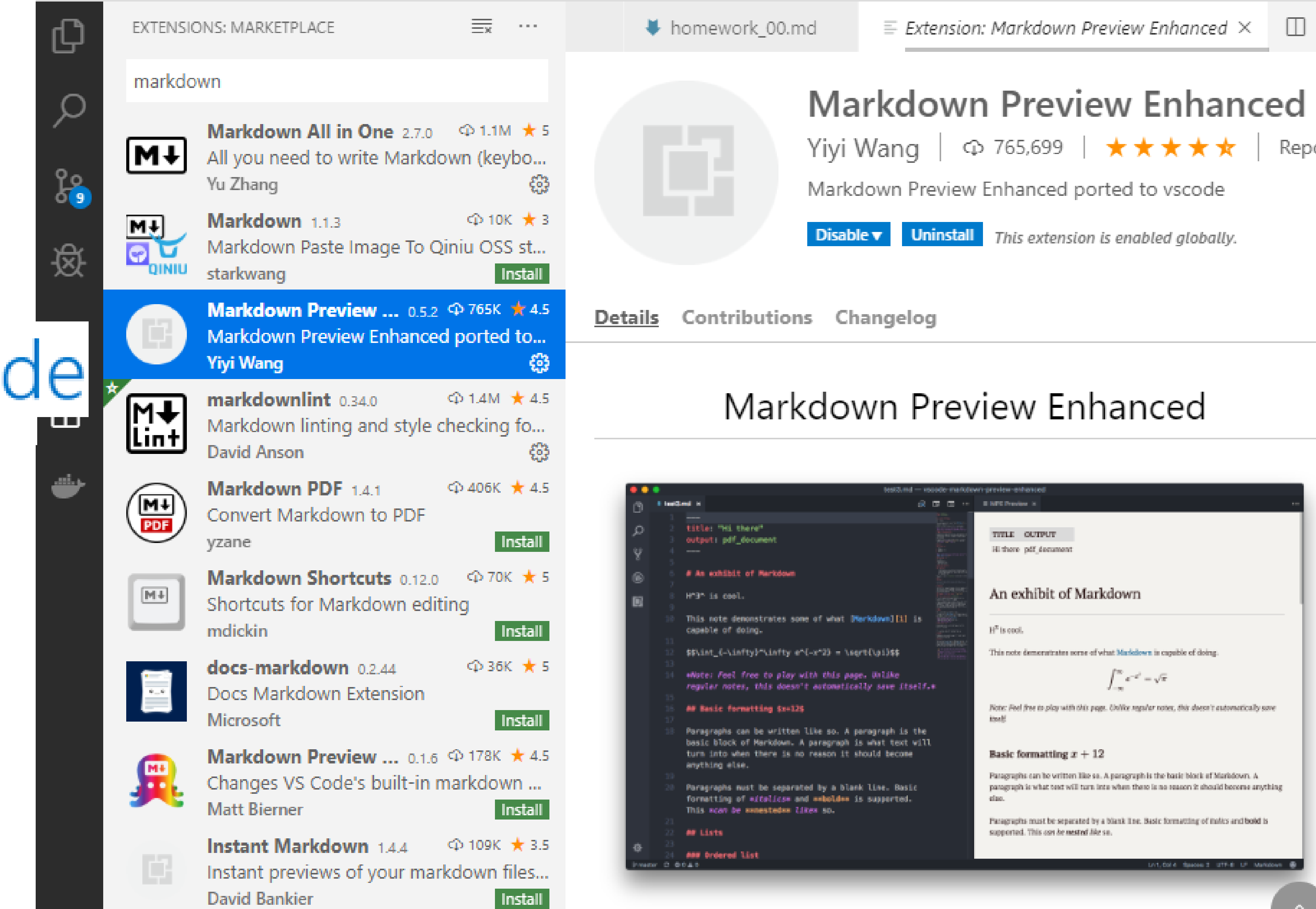
Software tutorial

VSCode

- Install Visual Studio Code
  - Explain the GUI of VSCode
  - Show example of MarkDown visualization
  - Show example of installing VSCode extensions

VSCode MarkDown (.md)

Visual Studio Code



EXTENSIONS: MARKETPLACE

markdown

Markdown All in One 2.7.0 1.1M ★ 5
All you need to write Markdown (keybo...
Yu Zhang

Markdown 1.1.3 10K ★ 3
Markdown Paste Image To Qiniu OSS st...
starkwang
Install

Markdown Preview ... 0.5.2 765K ★ 4.5
Markdown Preview Enhanced ported to...
Yiyi Wang

markdownlint 0.34.0 1.4M ★ 4.5
Markdown linting and style checking fo...
David Anson

Markdown PDF 1.4.1 406K ★ 4.5
Convert Markdown to PDF
yzane
Install

Markdown Shortcuts 0.12.0 70K ★ 5
Shortcuts for Markdown editing
mdickin
Install

docs-markdown 0.2.44 36K ★ 5
Docs Markdown Extension
Microsoft
Install

Markdown Preview ... 0.1.6 178K ★ 4.5
Changes VS Code's built-in markdown ...
Matt Bierner
Install

Instant Markdown 1.4.4 109K ★ 3.5
Instant previews of your markdown files...
David Bankier
Install

homework_00.md | *Extension: Markdown Preview Enhanced* ×

Markdown Preview Enhanced

Yiyi Wang | 765,699 | ★★★★★ | Repo

Markdown Preview Enhanced ported to vscode

Disable ▾ | Uninstall | *This extension is enabled globally.*

Details | Contributions | Changelog

Markdown Preview Enhanced

```
---
title: "Hi there"
output: pdf_document
---

# An exhibit of Markdown

H^3^ is cool.

This note demonstrates some of what [Markdown][1] is
capable of doing.

$$\int_{-\infty}^\infty e^{-x^2} = \sqrt{\pi}$$

*Note: Feel free to play with this page. Unlike
regular notes, this doesn't automatically save itself.*

## Basic formatting $x+12$

Paragraphs can be written like so. A paragraph is the
basic block of Markdown. A paragraph is what text will
turn into when there is no reason it should become
anything else.

Paragraphs must be separated by a blank line. Basic
formatting of *italics* and **bold** is supported.
This *can be **nested** like* so.

## Lists

### Ordered list
```

TITLE	OUTPUT
Hi there	pdf_document

An exhibit of Markdown

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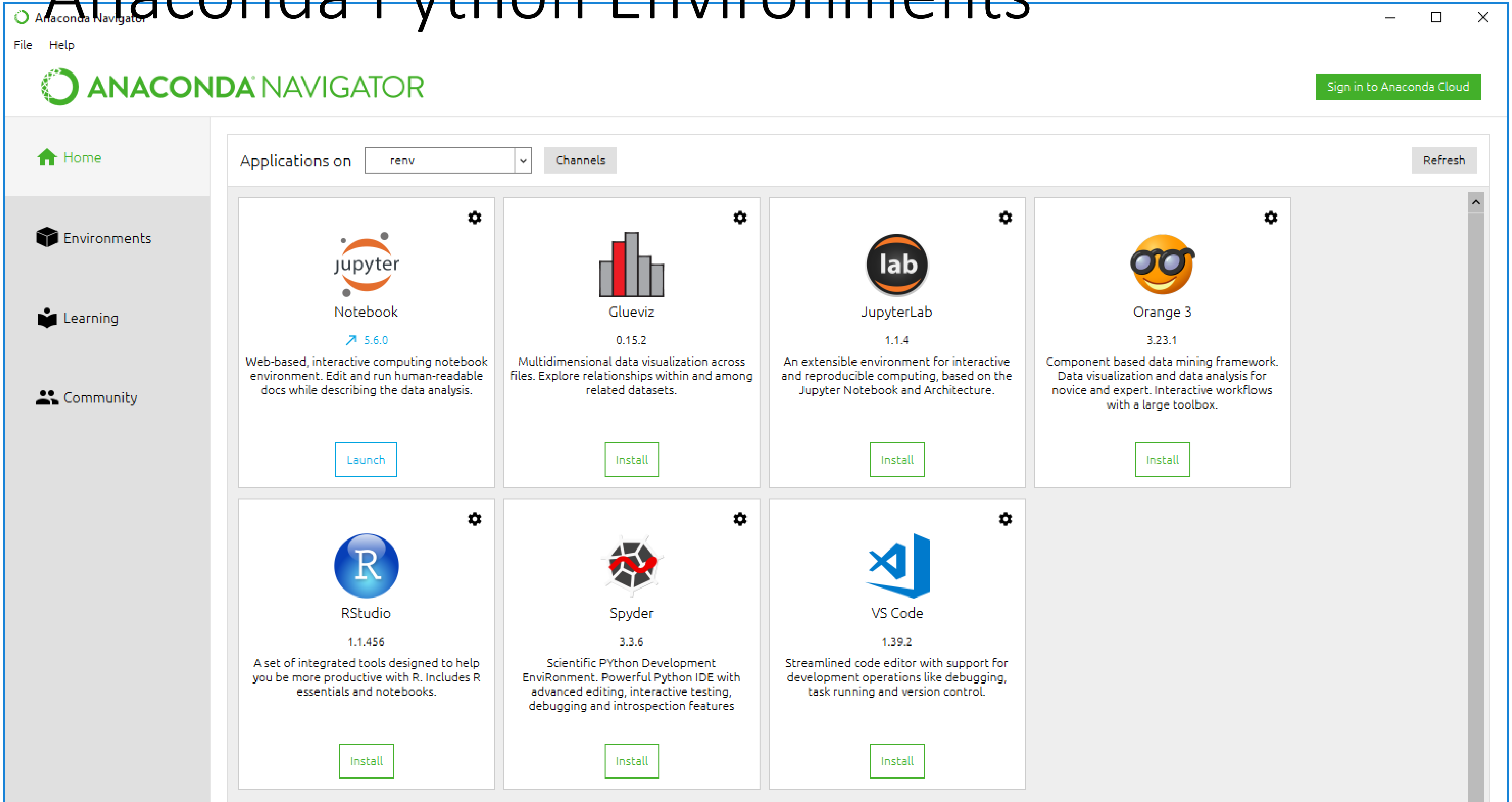
Anaconda Python Environments



Notebook

5.6.0

Web-based, interactive computing notebook environment. Edit and run human-readable docs while describing the data analysis.

Launch

Glueviz

0.15.2

Multidimensional data visualization across files. Explore relationships within and among related datasets.

Install

JupyterLab

1.1.4

An extensible environment for interactive and reproducible computing, based on the Jupyter Notebook and Architecture.

Install

Orange 3

3.23.1

Component based data mining framework. Data visualization and data analysis for novice and expert. Interactive workflows with a large toolbox.

Install

RStudio

1.1.456

A set of integrated tools designed to help you be more productive with R. Includes R essentials and notebooks.

Install

Spyder

3.3.6

Scientific PYthon Development EnviRonment. Powerful Python IDE with advanced editing, interactive testing, debugging and introspection features

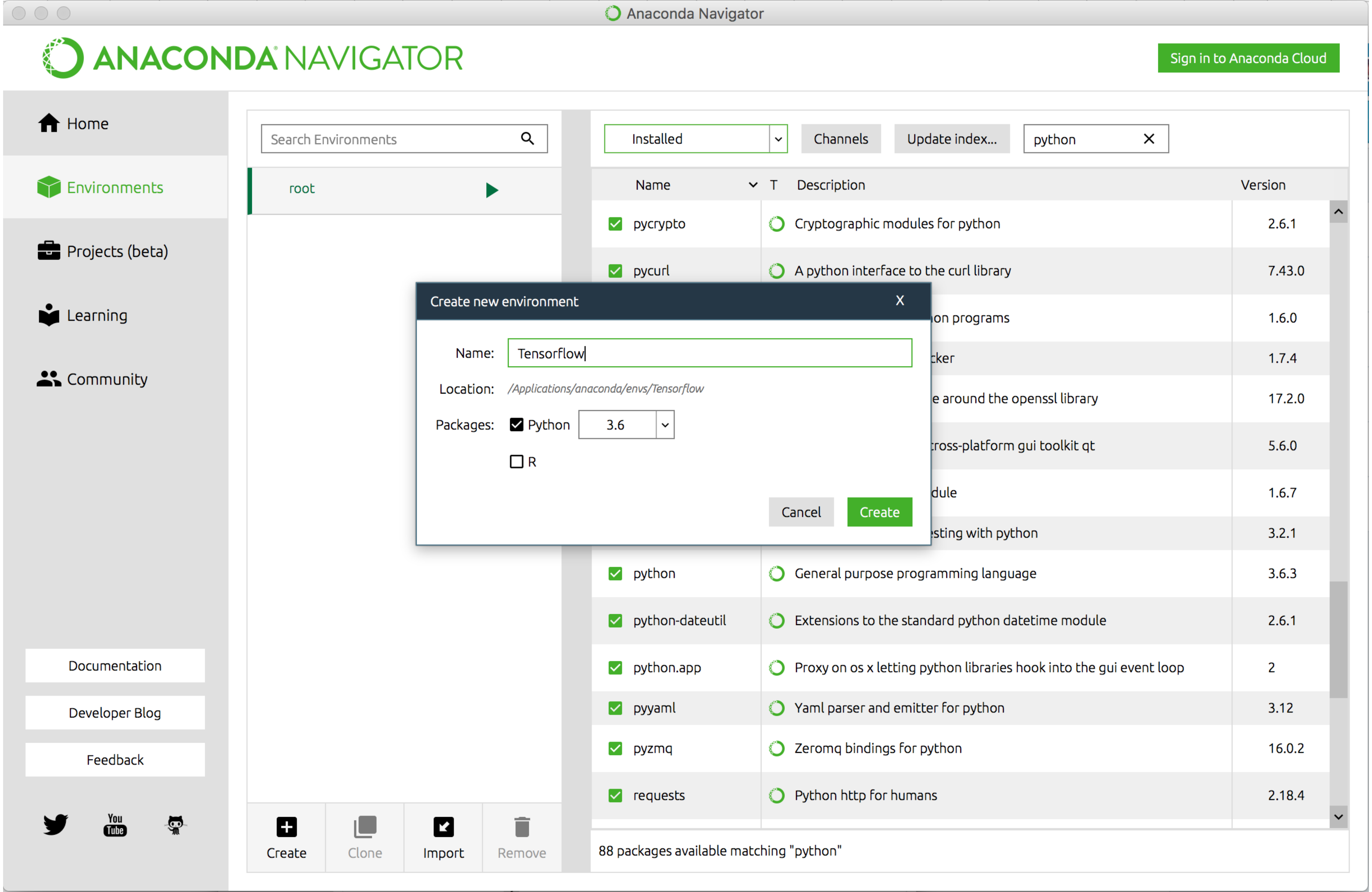
Install

VS Code

1.39.2

Streamlined code editor with support for development operations like debugging, task running and version control.

Install



Create new environment X

Name: Tensorflow

Location: */Applications/anaconda/envs/Tensorflow*

Packages: ☑ Python 3.6

□ R

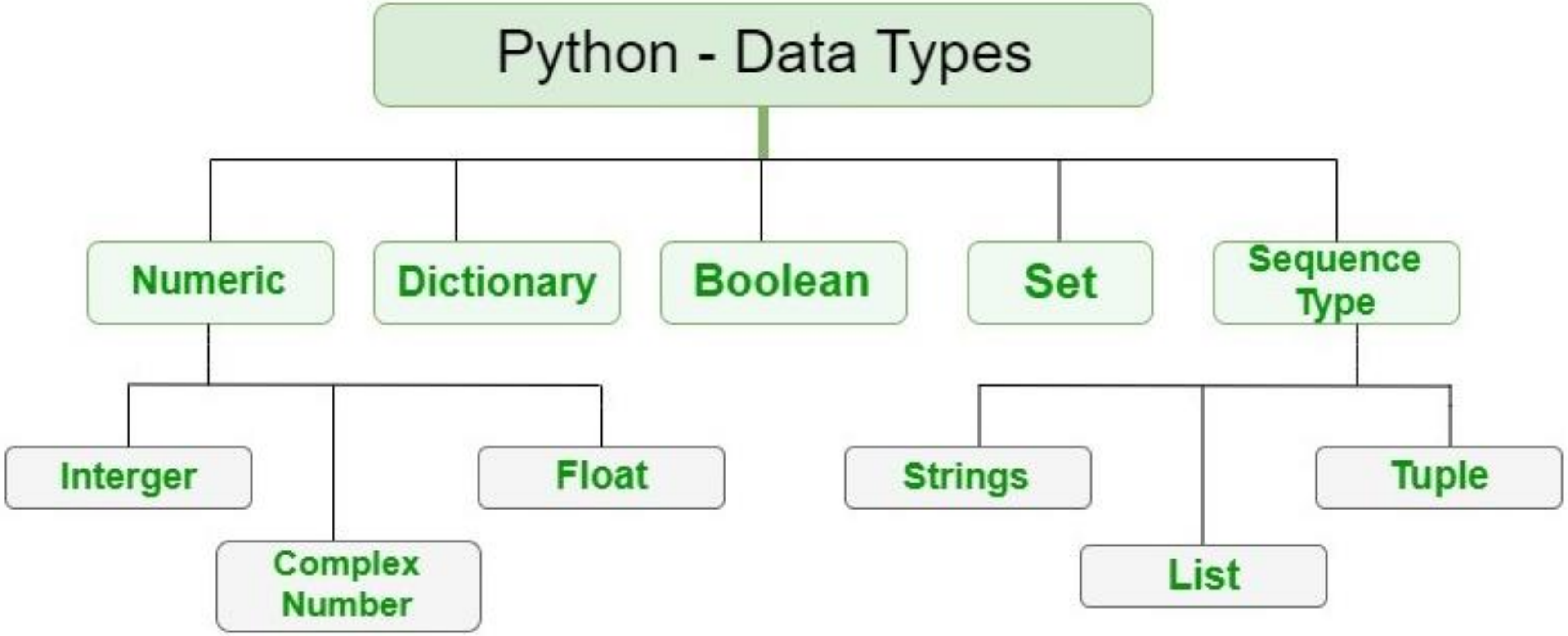
Cancel Create

Name	T	Description	Version
☑ pycrypto		Cryptographic modules for python	2.6.1
☑ pycurl		A python interface to the curl library	7.43.0
		on programs	1.6.0
		cker	1.7.4
		e around the openssl library	17.2.0
		ross-platform gui toolkit qt	5.6.0
		dule	1.6.7
		sting with python	3.2.1
☑ python		General purpose programming language	3.6.3
☑ python-dateutil		Extensions to the standard python datetime module	2.6.1
☑ python.app		Proxy on os x letting python libraries hook into the gui event loop	2
☑ pyyaml		Yaml parser and emitter for python	3.12
☑ pyzmq		Zeromq bindings for python	16.0.2
☑ requests		Python http for humans	2.18.4

88 packages available matching "python"

Python

Python



Python - Data Types

Numeric

Dictionary

Boolean

Set

Sequence Type

Interger

Complex Number

Float

Strings

List

Tuple

https://www.geeksforgeeks.org/python-data-types/

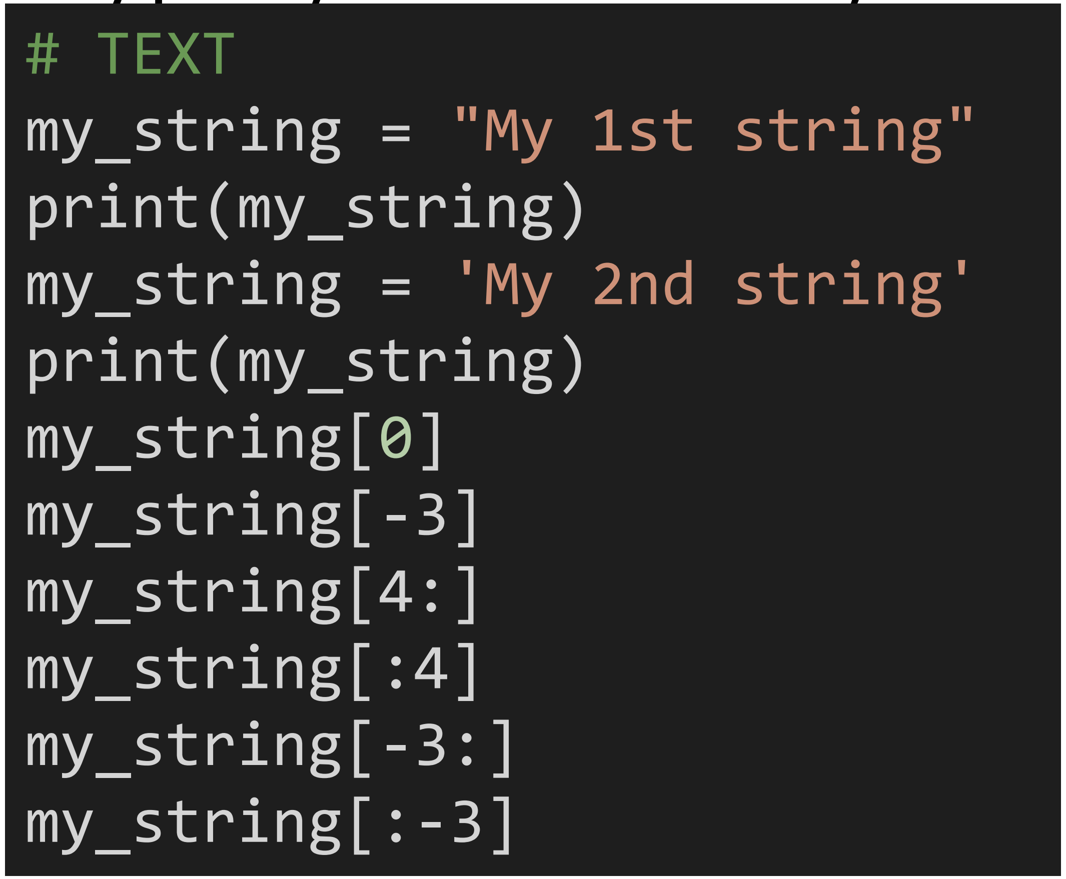
Python (Data Types/Structures)

```python
# THIS IS A COMMENT

# NUMBERS
a = 5 # Integers
print("Type of a: ", type(a))
b = 5.0 # Numbers on the real line (float)
print("\nType of b: ", type(b))
```

>_ Code

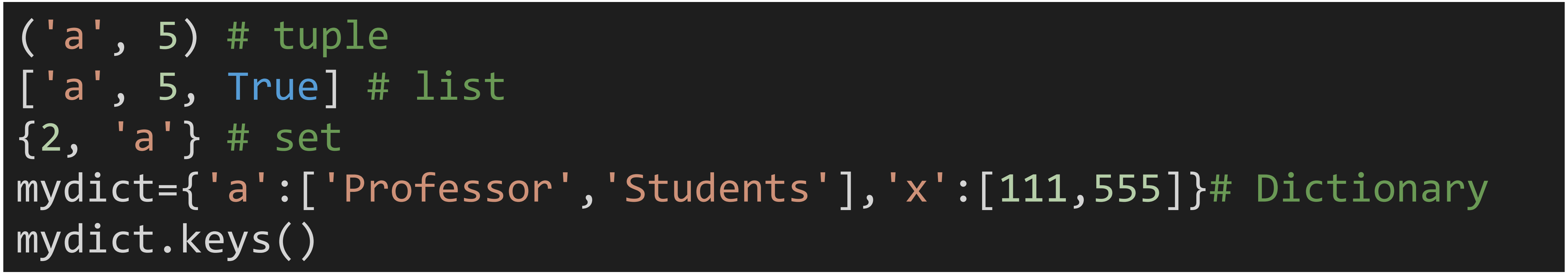
Python (Data Types/Structures)



```
# TEXT
my_string = "My 1st string"
print(my_string)
my_string = 'My 2nd string'
print(my_string)
my_string[0]
my_string[-3]
my_string[4:]
my_string[:4]
my_string[-3:]
my_string[:-3]
```

M	y		2	n	d		s	t	r	i	n	g
0	1	2	3	4	5	6	7	8	9	10	11	12
-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1

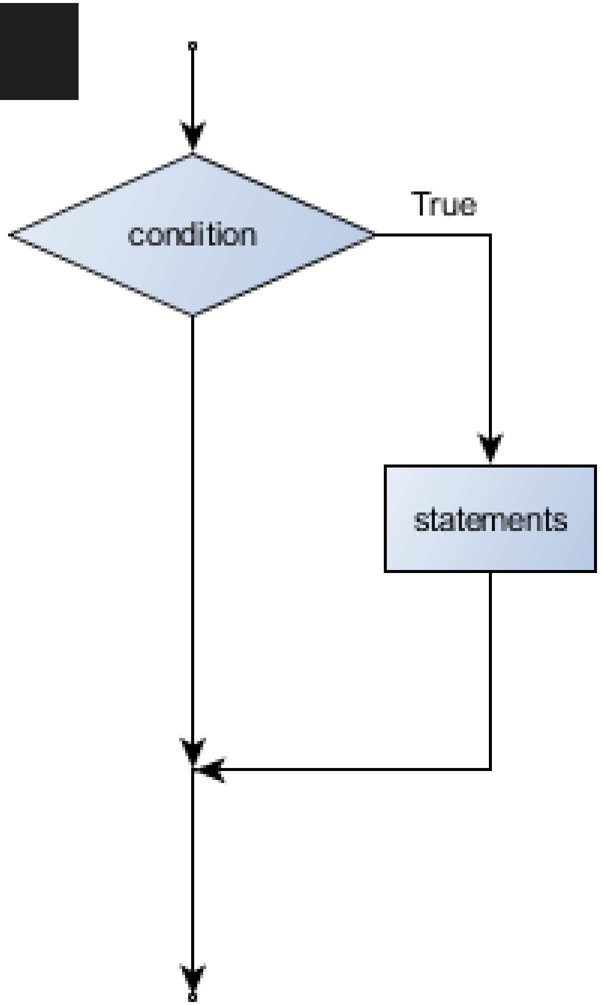
Python (Data Types/Structures)



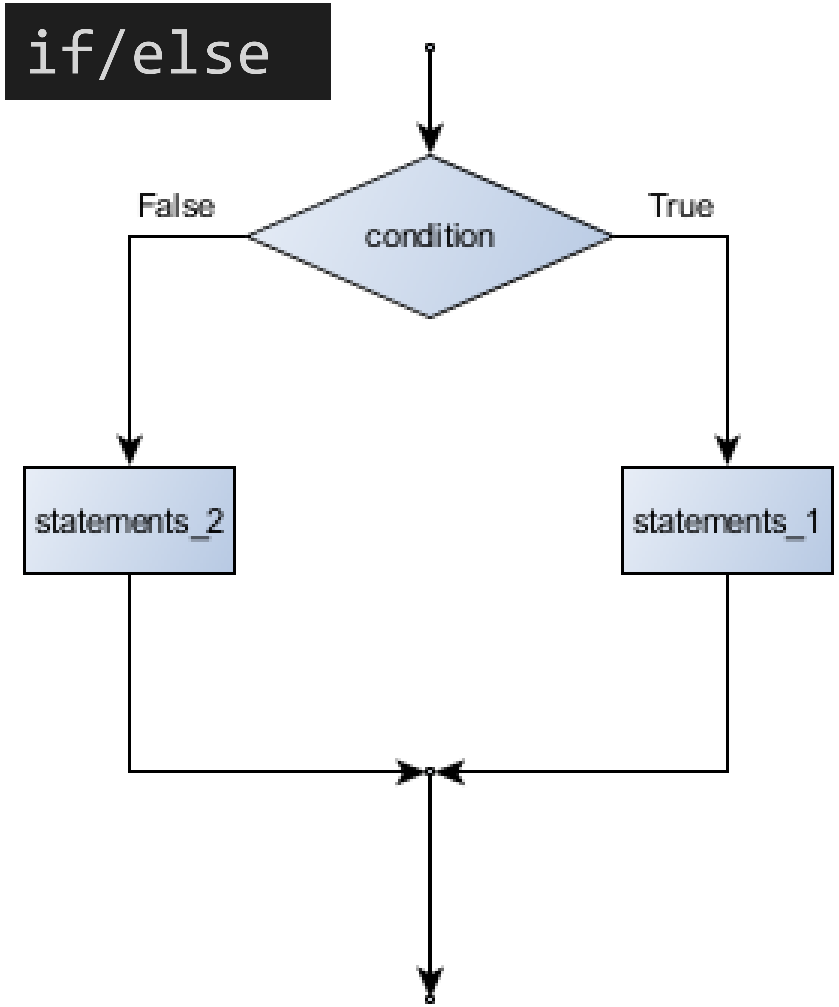
```
('a', 5) # tuple
['a', 5, True] # list
{2, 'a'} # set
mydict={'a':['Professor','Students'],'x':[111,555]}# Dictionary
mydict.keys()
```

Python (Coonditionals and loops)

`if`

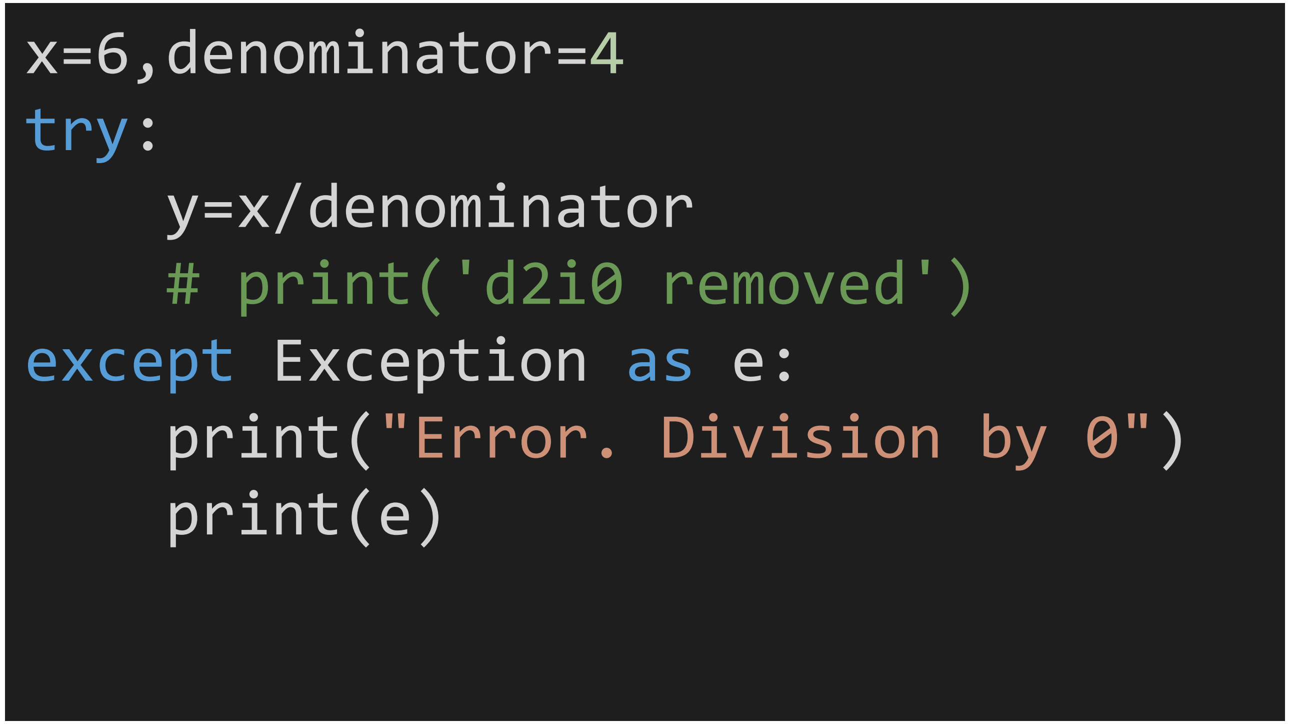


`if/else`



`for`

Python Exceptions



```
x=6,denominator=4
try:
    y=x/denominator
    # print('d2i0 removed')
except Exception as e:
    print("Error. Division by 0")
    print(e)
```

Python function **def**inition

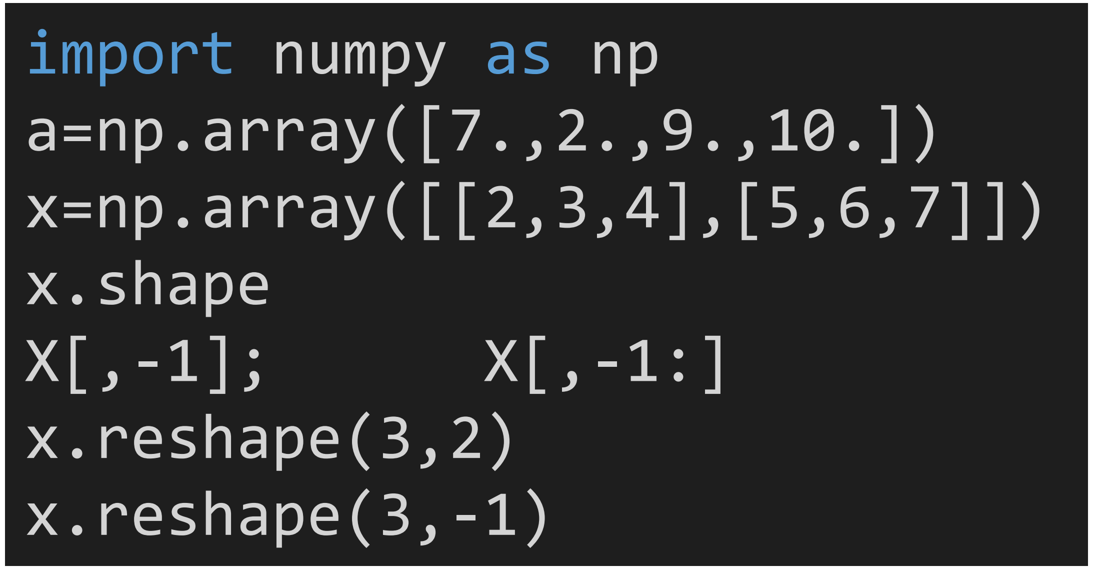
```
def hw(x, a="aaaa", b=4, mylist=[5, 'KKK', 'PPP']):
    y=5*b
    return(a)

hw(x=3)
```

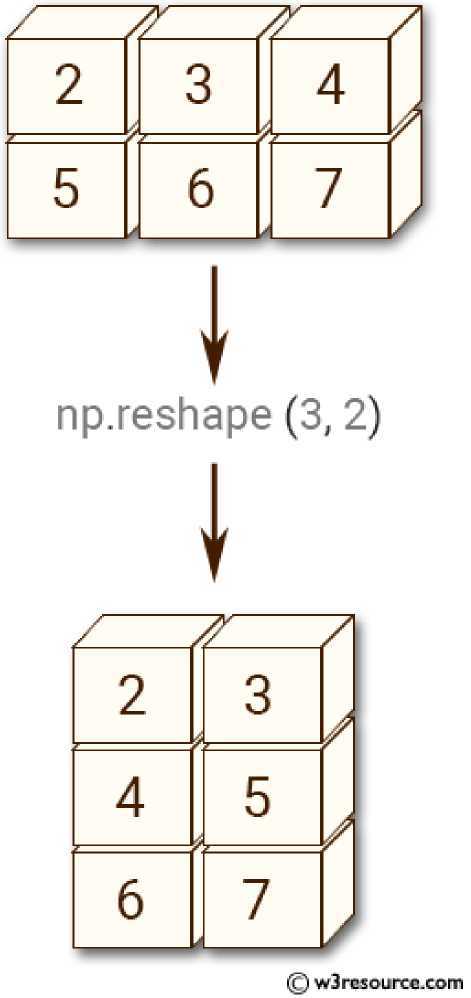
Exercise

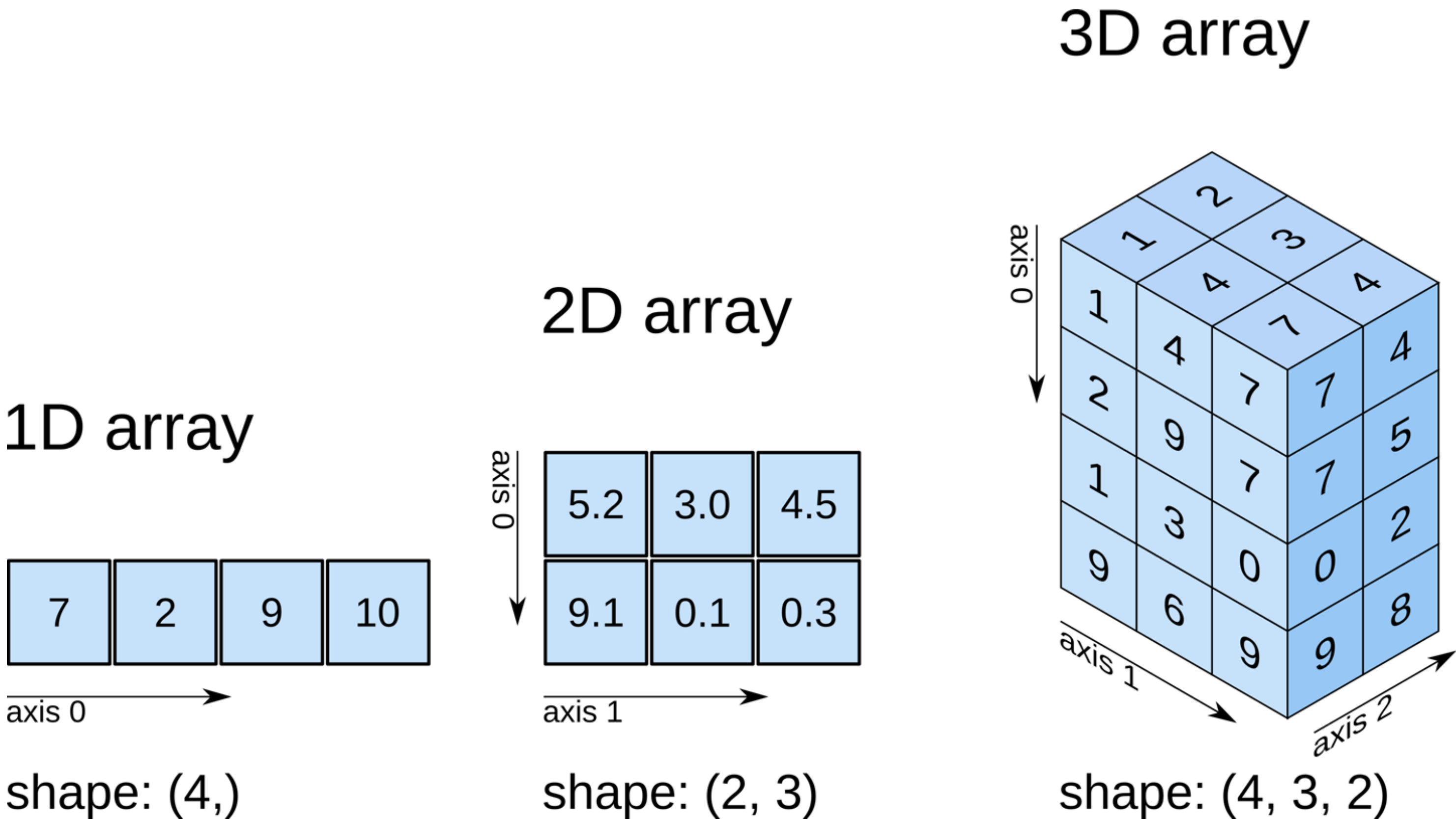
- Create a function that return the sum of 3 numbers
- Create a function `is_even()` that checks if a number is divisible by 2
- Create a for loop that prints only even numbers (5%2)
- Create a function that prints only the last 3 characters of a string, one-by-one

NumPy Arrays

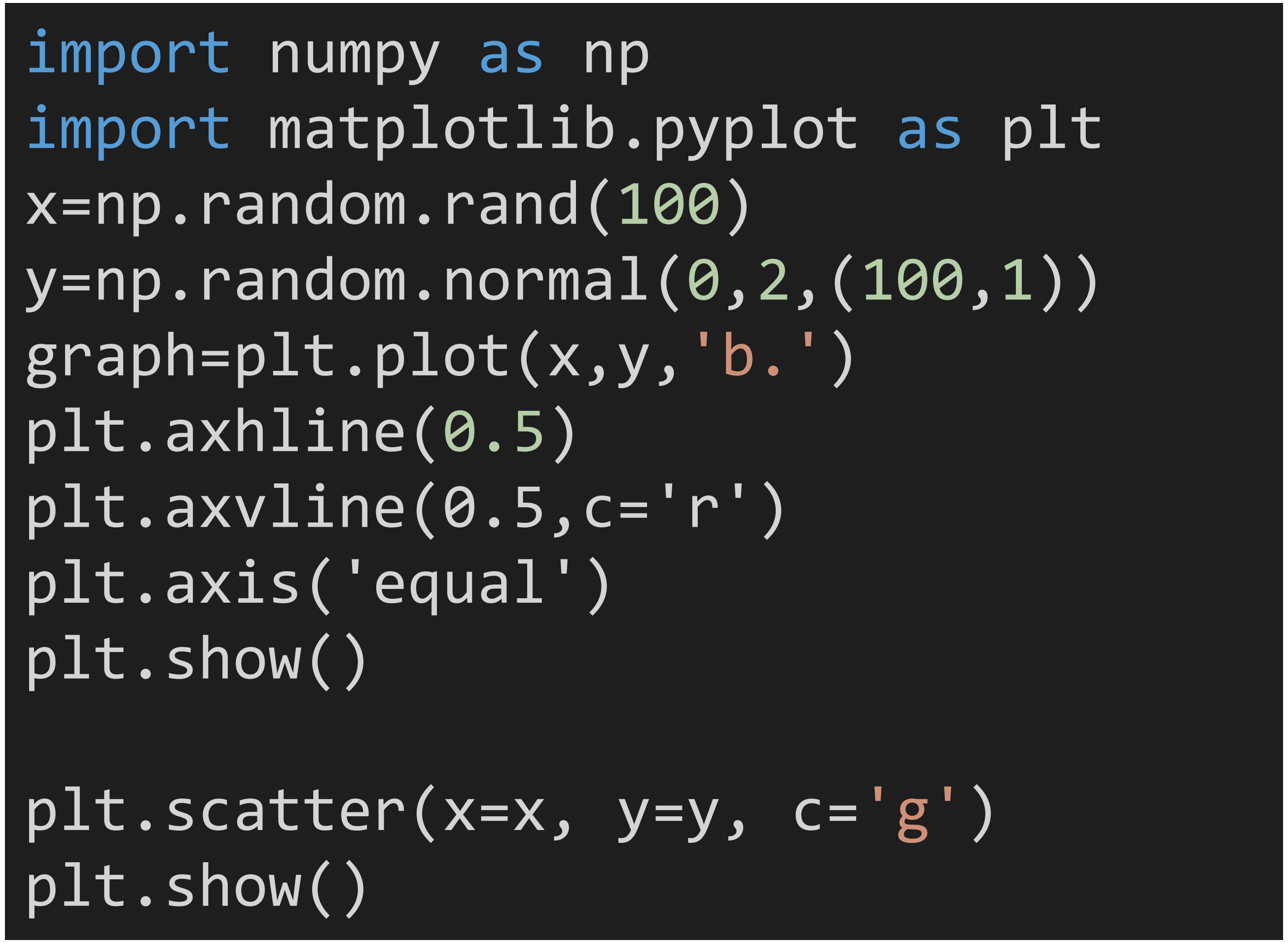


```
import numpy as np
a=np.array([7.,2.,9.,10.])
x=np.array([[2,3,4],[5,6,7]])
x.shape
X[,-1];      X[,-1:]
x.reshape(3,2)
x.reshape(3,-1)
```





matplotlib

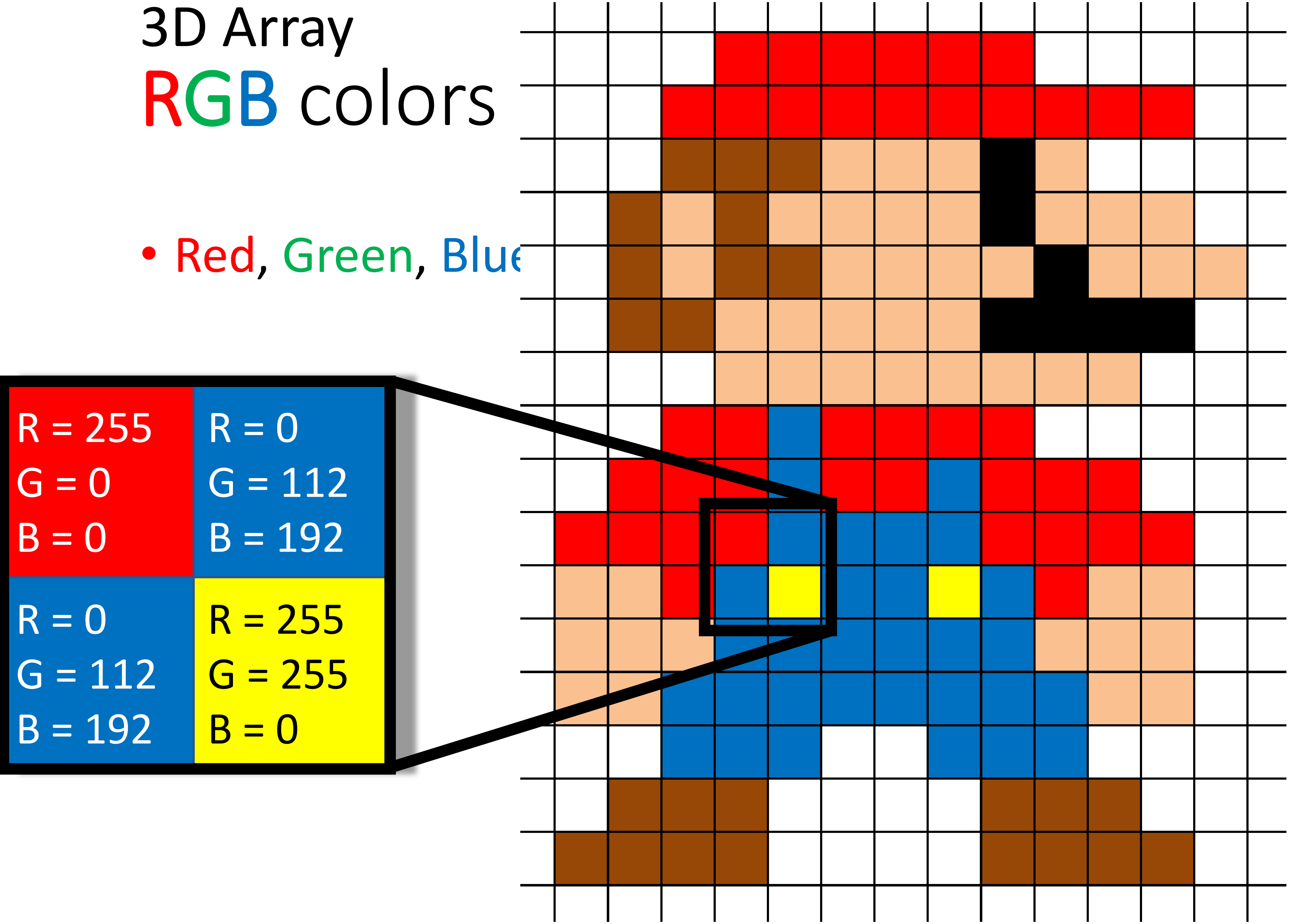


```
import numpy as np
import matplotlib.pyplot as plt
x=np.random.rand(100)
y=np.random.normal(0,2,(100,1))
graph=plt.plot(x,y,'b.')
plt.axhline(0.5)
plt.axvline(0.5,c='r')
plt.axis('equal')
plt.show()

plt.scatter(x=x, y=y, c='g')
plt.show()
```

3D Array
RGB colors

- Red, Green, Blue

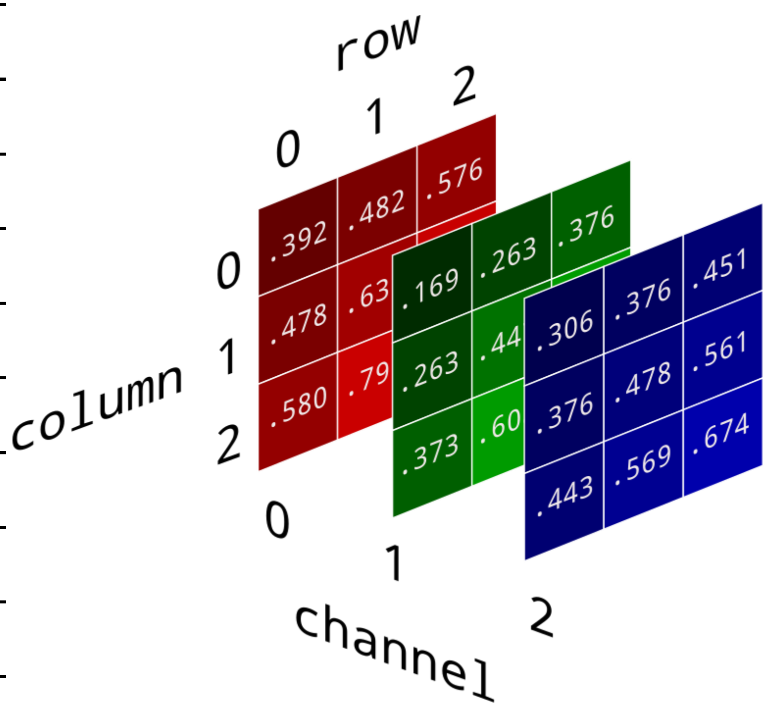


R = 255
G = 0
B = 0
	R = 0
	G = 112
	B = 192

R = 0
G = 112
B = 192
	R = 255
	G = 255
	B = 0

>_ Code

Numpy Array:

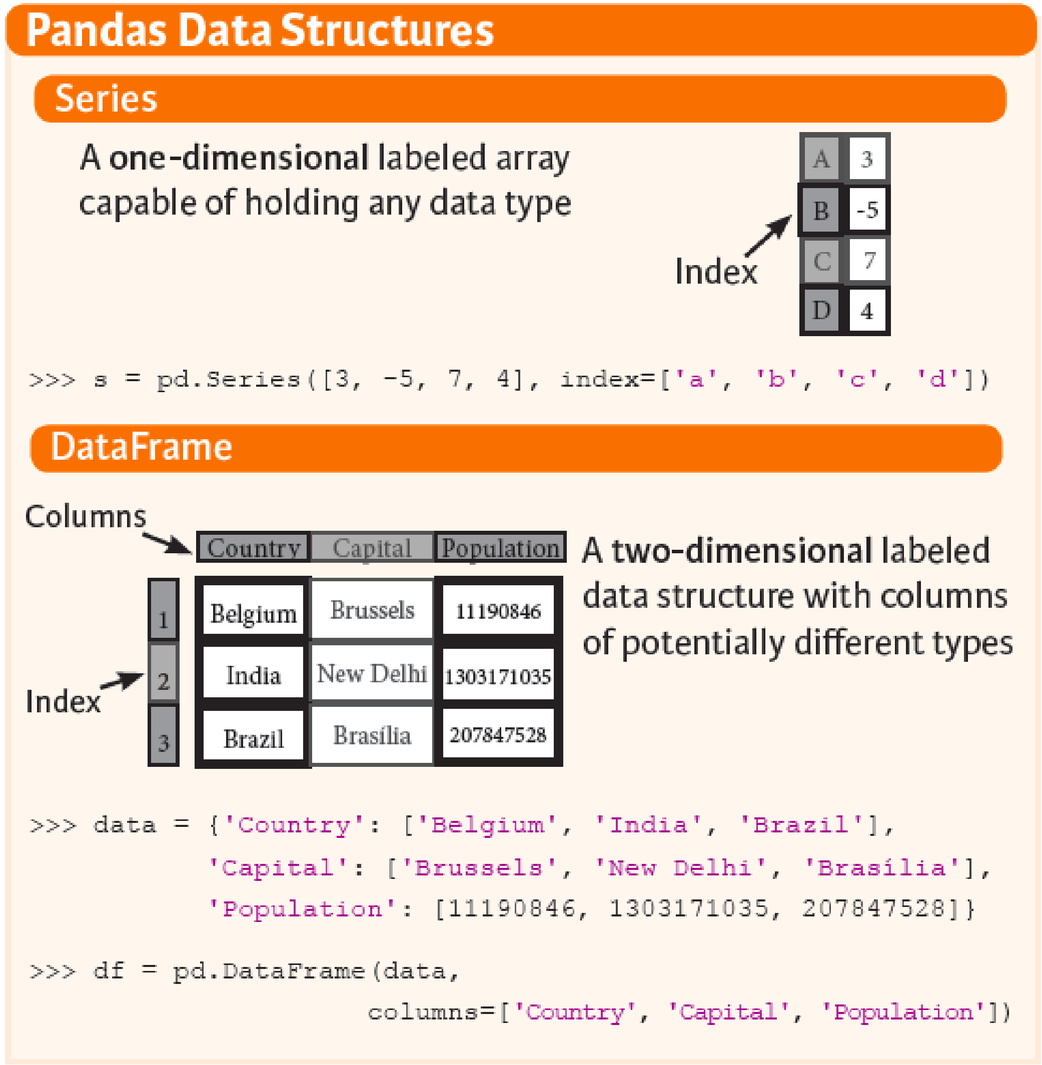


.392	.482	.576
.478	.63	
.580	.79	

.169	.263	.376
.263	.44	
.373	.60	

.306	.376	.451
.376	.478	.561
.443	.569	.674

Python (Pandas)



Pandas Data Structures

Series

A one-dimensional labeled array capable of holding any data type

Index

A	3
B	-5
C	7
D	4

```
>>> s = pd.Series([3, -5, 7, 4], index=['a', 'b', 'c', 'd'])
```

DataFrame

Columns

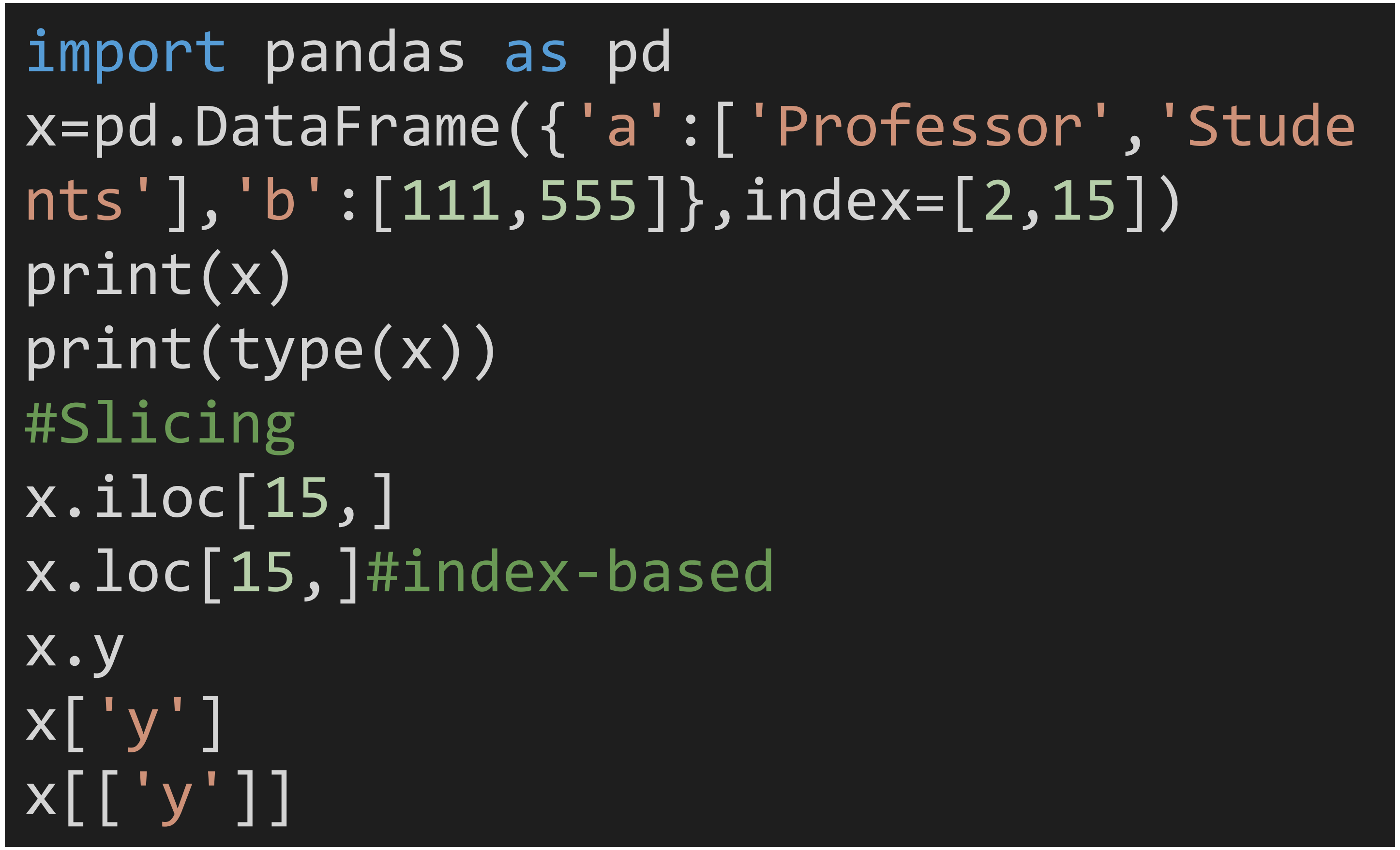
Index

	Country	Capital	Population
1	Belgium	Brussels	11190846
2	India	New Delhi	1303171035
3	Brazil	Brasília	207847528

A two-dimensional labeled data structure with columns of potentially different types

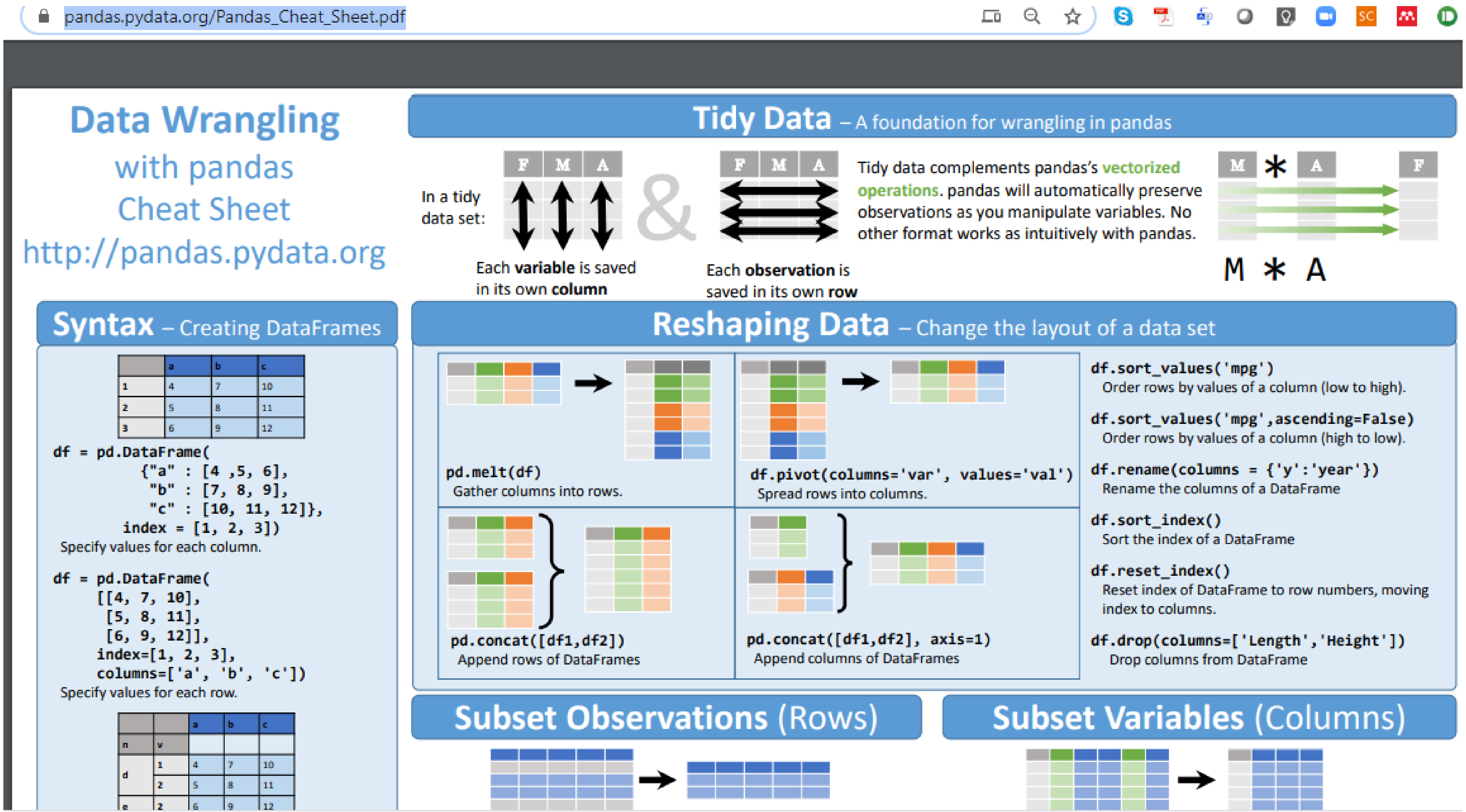
```
>>> data = {'Country': ['Belgium', 'India', 'Brazil'],
            'Capital': ['Brussels', 'New Delhi', 'Brasília'],
            'Population': [11190846, 1303171035, 207847528]}

>>> df = pd.DataFrame(data,
                      columns=['Country', 'Capital', 'Population'])
```



```
import pandas as pd
x=pd.DataFrame({'a':['Professor','Students'],'b':[111,555]},index=[2,15])
print(x)
print(type(x))
#Slicing
x.iloc[15,]
x.loc[15,]#index-based
x.y
x['y']
x[['y']]
```

python™ pandas



pandas.pydata.org/Pandas_Cheat_Sheet.pdf

Data Wrangling

with pandas Cheat Sheet

http://pandas.pydata.org

Tidy Data – A foundation for wrangling in pandas

In a tidy data set:

Each **variable** is saved in its own **column**

Each **observation** is saved in its own **row**

Tidy data complements pandas's vectorized operations. pandas will automatically preserve observations as you manipulate variables. No other format works as intuitively with pandas.

Syntax – Creating DataFrames

	a	b	c
1	4	7	10
2	5	8	11
3	6	9	12

```
df = pd.DataFrame(
          {"a" : [4 ,5, 6],
           "b" : [7, 8, 9],
           "c" : [10, 11, 12]},
        index = [1, 2, 3])
```

Specify values for each column.

```
df = pd.DataFrame(
     [[4, 7, 10],
      [5, 8, 11],
      [6, 9, 12]],
     index=[1, 2, 3],
     columns=['a', 'b', 'c'])
```

Specify values for each row.

		a	b	c
n	v			
d	1	4	7	10
	2	5	8	11
e	2	6	9	12

Reshaping Data – Change the layout of a data set

`pd.melt(df)`
Gather columns into rows.

`df.pivot(columns='var', values='val')`
Spread rows into columns.

`pd.concat([df1,df2])`
Append rows of DataFrames

`pd.concat([df1,df2], axis=1)`
Append columns of DataFrames

`df.sort_values('mpg')`
Order rows by values of a column (low to high).

`df.sort_values('mpg',ascending=False)`
Order rows by values of a column (high to low).

`df.rename(columns = {'y':'year'})`
Rename the columns of a DataFrame

`df.sort_index()`
Sort the index of a DataFrame

`df.reset_index()`
Reset index of DataFrame to row numbers, moving index to columns.

`df.drop(columns=['Length','Height'])`
Drop columns from DataFrame

Subset Observations (Rows)

Subset Variables (Columns)

Jupyter Lab Notebooks

VSCode Extensions

- Markdown
- Python
- Dash/Zeal
  - Ctrl+H

Homework assignment 01