Python for Data Science

Sirakorn Lamyai

September 19, 2019

Student, Kasetsart U.

About me

Sirakorn Lamyai

- DAKDL Laboratory, Kasetsart University
- Research Assistant Intern, 2019, Vidyasirimedhi Institute of Science and Technology
- Research Assistant Intern, 2018, Vidyasirimedhi Institute of Science and Technology
- Love drinking tea
- Knows a little about Python

I know a little about Python

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When I say I know *a little* about Python...

I know a little about Python

When I say I know *a little* about Python...

- I think there's some better methods than I'm using

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When I say I know *a little* about Python...

- I think there's some better methods than I'm using
- I think I do sometimes make mistakes
- There are tons of people who know things much more than me
- I think there's much more for me to learn!

Prerequisite

A basic Python knowledge will do!

Your expectations from this talk

Outline

- Data Science
- Python
  - Python environments
  - Jupyter
- Python Data Structures
- Pandas
- Blending it all together

Data Science

The Data Science Process: OSEMNI

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- **Obtain** data from relevent sources

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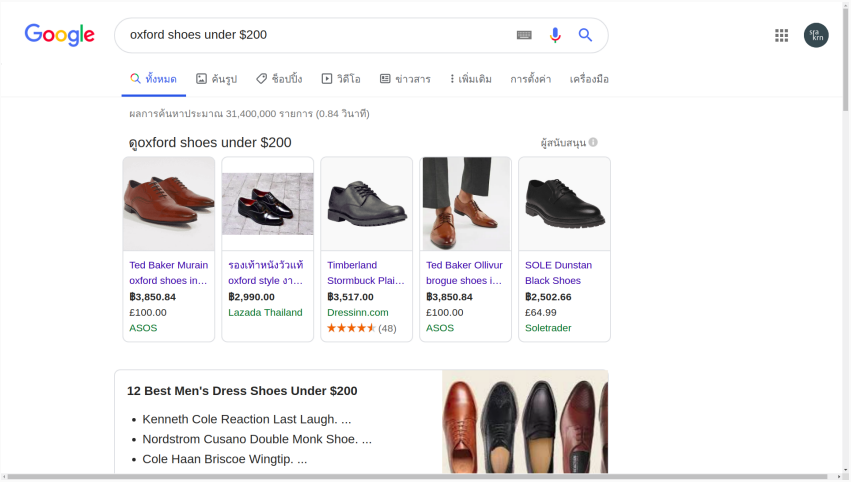
- **iNterpret** and use the results obtained
- **Interate** and rethink about your outputs

Why data?


Google
oxford shoes under $200
ทั้งหมด
ค้นรูป
ช็อปปิ้ง
วิดีโอ
ข่าวสาร
เพิ่มเติม
การตั้งค่า
เครื่องมือ
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รองเท้าหนังวัวแท้ oxford style งา…
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Lazada Thailand
Timberland Stormbuck Plai…
฿3,517.00
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Ted Baker Ollivur brogue shoes i…
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ASOS
SOLE Dunstan Black Shoes
฿2,502.66
£64.99
Soletrader
12 Best Men's Dress Shoes Under $200
Kenneth Cole Reaction Last Laugh. ...
Nordstrom Cusano Double Monk Shoe. ...
Cole Haan Briscoe Wingtip. ...

Why data?


Search
Sirakorn
Home
Create
Sirakorn Lamyai
News Feed
Messenger
Watch
Marketplace
Shortcuts
เทอมหน้าจะไปฝึกงา…
61/2 Algo II SKE
CPE Internship 1
ไรท์ติ้งอินไทย - Writ… 20+
See More...
Explore
Groups
Pages
Events 1
Fundraisers
Saved 1
See More...
Curated and Co.
Sponsored ·
New Arrival Berwick Penny Loafer Collection !
Berwick Penny Loafer ที่มีรุ่นใหม่เข้ามาให้เลือกกันถึง 6 แบบเลยทีเดียวครับ ไม่ว่าจะเป็น Oiled 173 Suede, Polo Brown Suede ที่ได้รับนิยมมากๆในต่างประเทศ รวมถึงหนัง Smooth อีก 4 แบบที่สวยลงตัวมากๆ ไม่ว่าจะเป็น Vegano Melize, Moka และสุดท้ายเป็นสีดำ Black Box Calf ที่คลาสสิกตลอดกาล ----------... See More
Berwick
Patinya Yongyai (Not'Pty)
81 mutual friends
Add Friend
Remove
Kanoktat Ninklam
79 mutual friends
Add Friend
Remove
Rung Nattayaporn
3 mutual friends
Add Friend
Remove
Chakri Lowphansirikul
5 mutual friends
Add Friend
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Unnop Nushprasert
15 mutual friends
Add Friend
Remove
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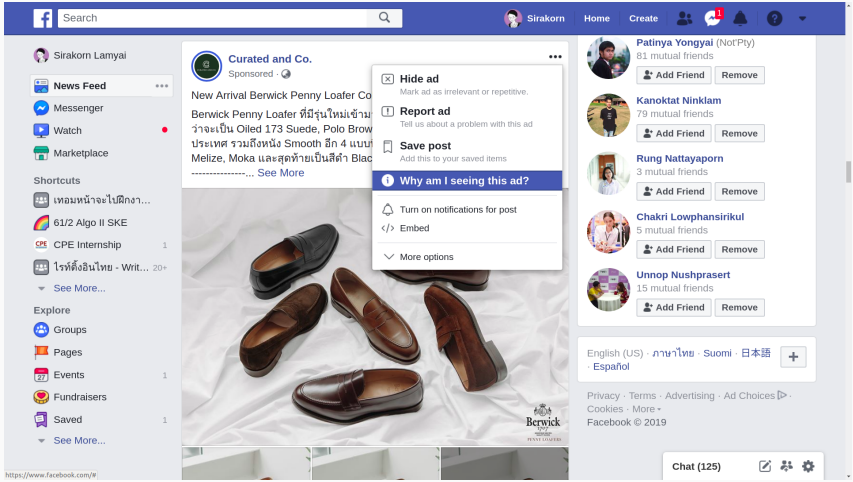
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See More...
Explore
Groups
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Fundraisers
Saved
See More...
Curated and Co.
Sponsored
New Arrival Berwick Penny Loafer Co
Berwick Penny Loafer ที่มีรุ่นใหม่เข้ามา
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Melize, Moka และสุดท้ายเป็นสีดำ Blac
----------... See More
Hide ad
Mark ad as irrelevant or repetitive.
Report ad
Tell us about a problem with this ad
Save post
Add this to your saved items
Why am I seeing this ad?
Turn on notifications for post
Embed
More options
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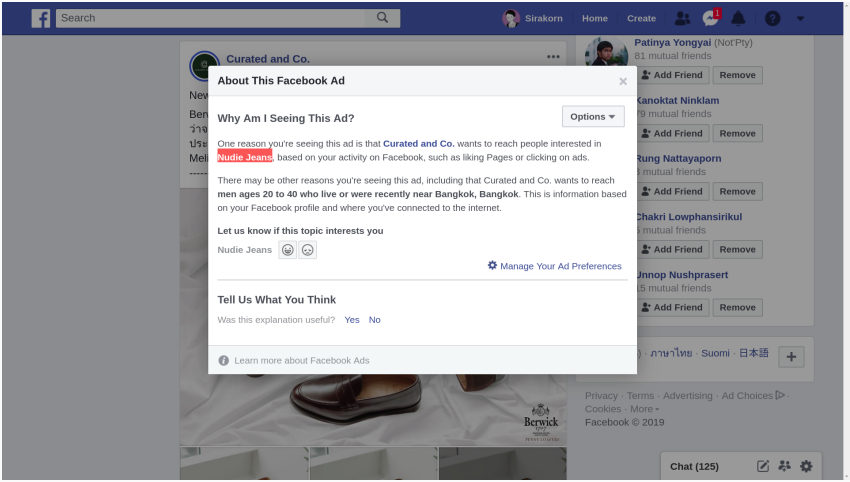
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Manage Your Ad Preferences
Tell Us What You Think
Was this explanation useful? Yes No
Learn more about Facebook Ads
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Data is the new oil

Tools for data analysis

With GUIs

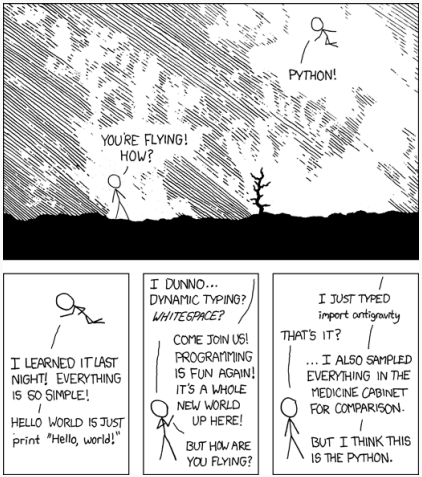
- Spreadsheets
  - Excel
  - Google Spreadsheets
  - Lotus 1-2-3
- Modelling and Visualisation
  - RapidMiner Studio
  - Weka
  - Tableau

As programming languages

- For data insights
  - R
  - Python
- For data retrieval
  - SQL

Python

Python



Courtesy: xkcd (`https://xkcd.com/353/`)

I *loved* Python...

- Read it, understand it
- Multiparadigm
- Batteris included
- Lots of great, great libraries!

Python Packages

pip

`pip`

- **PyPA** (**Py**thon **P**ackaging **A**uthority)'s recommended package installer

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- **PyPA** (**Py**thon **P**ackaging **A**uthority)'s recommended package installer
- Obtains packages from **PyPI** (**Py**thon **P**ackaging **I**ndex)
- Many useful packages for us to use!

Anaconda Python Distribution

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- Cross-platform Python Distribution

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- Ships with its own package and environment manager
  - Its environment manager capability is not found in Python vanilla installation
  - Fetches the packages from its own repository, not PyPI
- Aims for Data Science use
- **Entirely separated Python**

Environments 101: $PATH

```
$ echo $PATH
/home/srakrn/.pyenv/plugins/pyenv-virtualenv/shims:/home/
   srakrn/.pyenv/shims:/home/srakrn/.pyenv/bin:/home/srakrn
   /.local/bin:/usr/local/bin:/usr/local/sbin:/home/srakrn/.
   local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/
   local/games:/snap/bin
```

Different machines, different Pythons

On my laptop...

```
srakrn@epsilon-ubuntu:~$ which python
/home/srakrn/.pyenv/shims/python
```

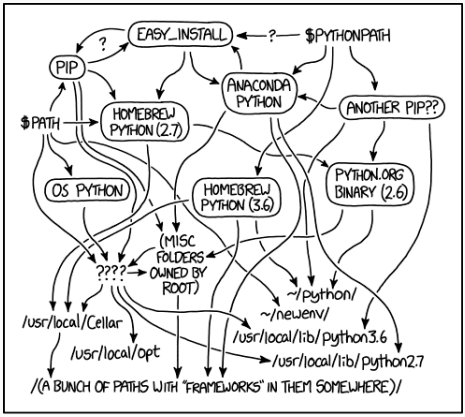
On my https://charles.srakrn.me/ server...

```
srakrn@charles:~$ which python
/usr/bin/python
srakrn@charles:~$ which python3
/usr/bin/python3
```

Installed pip

```
$ pip -V
pip 8.1.1 from /usr/lib/python2.7/dist-packages (python 2.7)
$ pip3 -V
pip 8.1.1 from /usr/lib/python2.7/dist-packages (python 3.6)
```

Perhaps now you understand me...



Courtesy: xkcd (`https://xkcd.com/1987/`)

Jupyter

Jupyter

Interactive computing environment

Jupyter Notebook

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- Thinks of a more *dynamic* coding environment.

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Jupyter Notebook

- Thinks of a more *dynamic* coding environment.
- Inserts snippets of codes alternately with texts, maths, and images.
- A wonderful tool for coding *documented code*.

Google Colaboratory (Colab)

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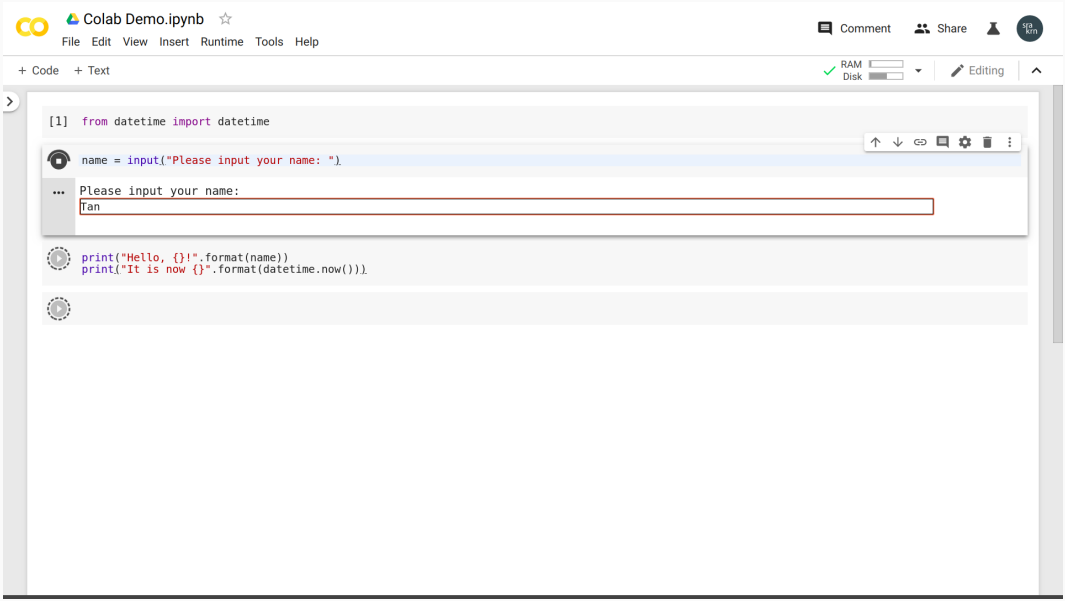
- Could be more powerful for some tasks (like Deep Learning) than your computer
- Free!

https://colab.research.google.com/


Colab Demo.ipynb
File Edit View Insert Runtime Tools Help
Comment
Share
+ Code + Text
RAM
Disk
Editing
[1] from datetime import datetime
name = input("Please input your name: ")
Please input your name:
Tan
print("Hello, {}!".format(name))
print("It is now {}".format(datetime.now()))

Caveats 1: Execution order

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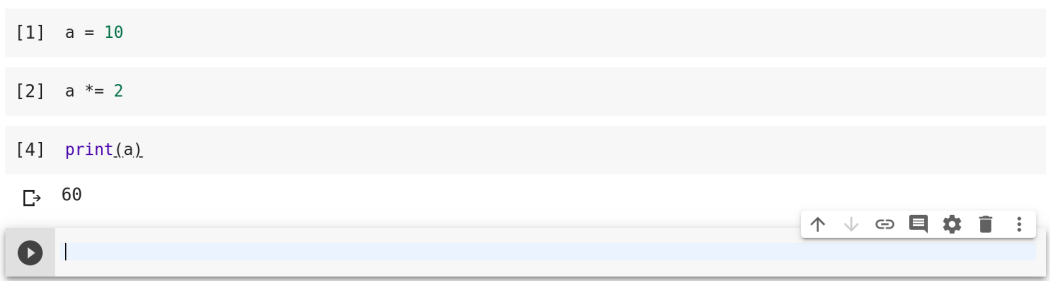
You'll do a lot of out-of-order code execution!

Caveats 2: Cell edits



Caveats 2: Cell edits

You might sometimes remove a cell, and that shows no visible trace without explicit query.

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Jupyter Notebook offers no cell edited marks, while Colab offers them (note: observe the greyed out cell number)

Caveats 3: Be neat and tidy

Jupyter Notebook and Colab, unlike IDE and code editors, offers a relatively poor **clean code** tools

- Syntax error highlighting
- Autocomplete
- Linting
- Code formatter

Sirakorn's Workflow Demo

Python Data Structures

Lists

```
a = [1, 2, 3, 4, 5]
b = ["Cats", "Dogs", "Penguins
   ", "Tonkatsu Pieces"]
c = [1, "1", True]
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  - So-called a **nested list**
- Can be resized.
  - No need to declare its size on the first declaration.

Lists

Accessing list

```
a = [1, 2, 3, 4, 5]
a[0]    # Accessing elements
a[1:3]  # Slicing
```

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```

Accessing list

- **Elementwise**: accessing one elements at a time)

Lists

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3 a[1:3]  # Slicing
```

Accessing list

- **Elementwise**: accessing one elements at a time)
- **Slicing**: accessing a sublist

List Functions

```
vowels = ["a", "e", "o", "u"]

# Get a's length
len(a)
# Append the new element to the end of a
a.append("y")
# Deletes the first occurence of the element from a
a.remove("y")
# Inserts the item into a list with a specified index
a.insert(2, "i")
```

List Functions

```
vowels = [1, 3, 2, 5, 4]
# Get the first index of a specified element
a.index(4)
# Sort a list and store into a new list
sorted_a = sorted(a)
# Sort a list, making changes directly to the old one
a.sort()
```

Dictionary

```
names = {
    "Cherprang": "Cher",
    "Manipa": "Khamin",
    "Jiradapa": "Pupe"
}

kami_nickname = names["Manipa"]
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- **Dictionaries** store values in a **key-pair** format.

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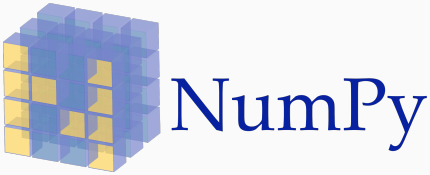
- **Dictionaries** store values in a **key-pair** format.
- From the positional index, dictionary takes the key as an index instead.

NumPy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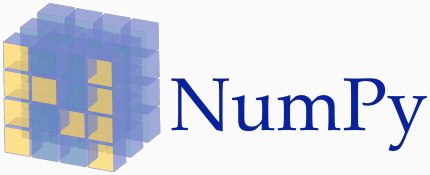
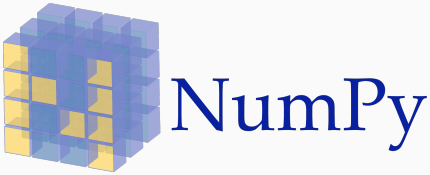


- NumPy is a powerful library for mathematical computation in Python

NumPy



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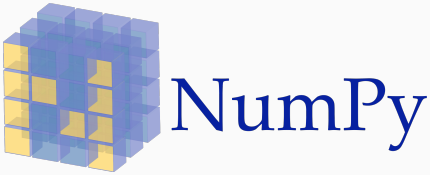
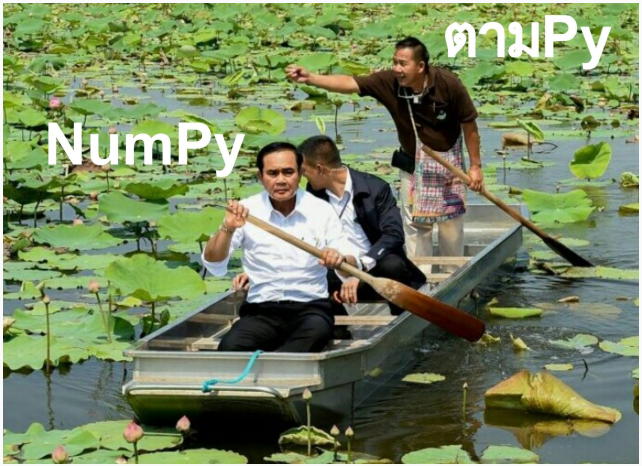
- It offers wide range of tools from data structures to advanced functions and operations



- NumPy is a powerful library for mathematical computation in Python
- It offers wide range of tools from data structures to advanced functions and operations
- A very strong ease in mathematical computation, **don't reinvent the wheels!**



Courtesy: Rebellious Professor,

`https://www.facebook.com/rebelliousprof/photos/a.301217273588245/599669117076391/`

Let’s go to Notebook!

I’m too lazy to cover the contents twice...

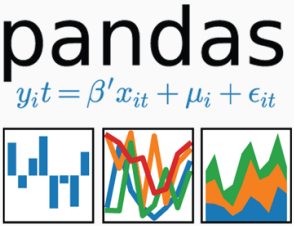
Pandas

Pandas

pandas

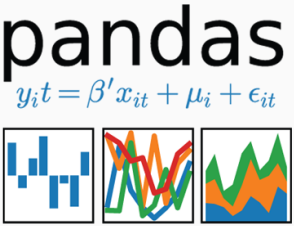
$$y_i t = \beta' x_{it} + \mu_i + \epsilon_{it}$$

Pandas



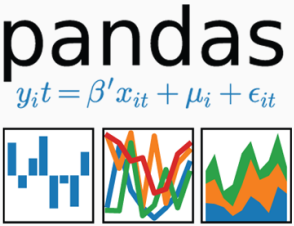
- Tabular-like structure

Pandas



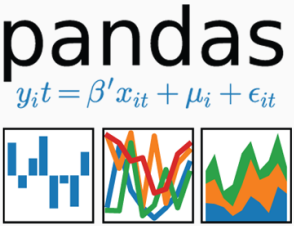
- Tabular-like structure
- High performance

Pandas



- Tabular-like structure
- High performance
- Easy to use

Pandas



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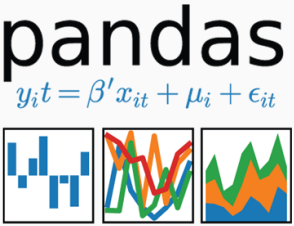
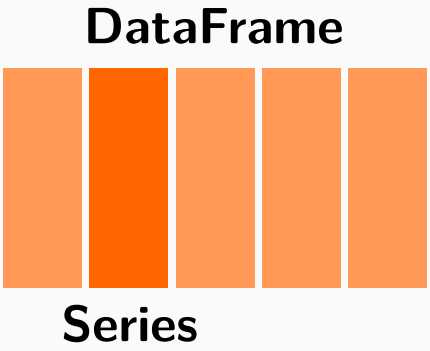
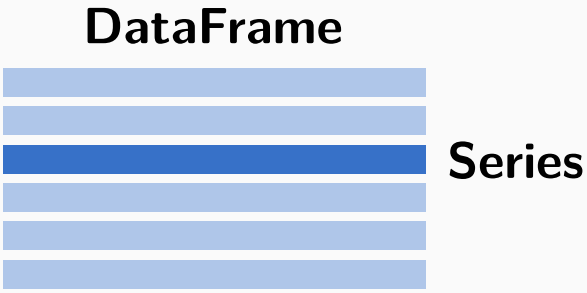


- Tabular-like structure
- High performance
- Easy to use
- Helps a lot in data preparation
- Considered as a wrapper for Numpy, although there's a lot more

Series and DataFrame

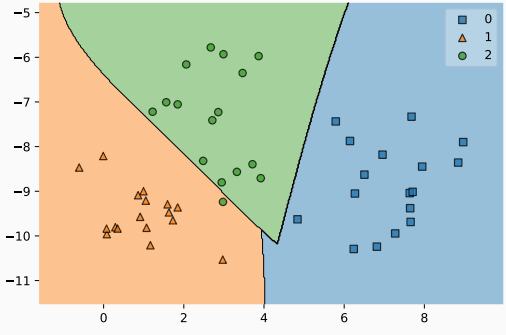




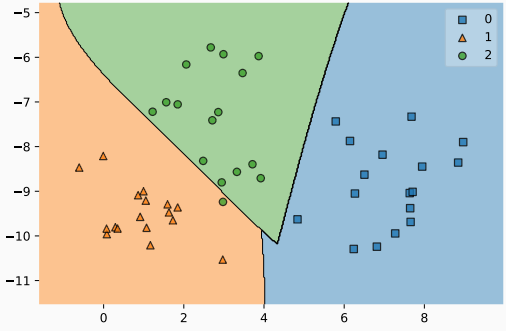
Let’s go to Notebook!

Data Visualisation

Data Visualisation

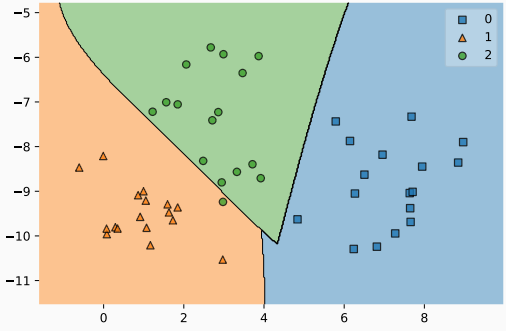


Data Visualisation



Why Visualise?

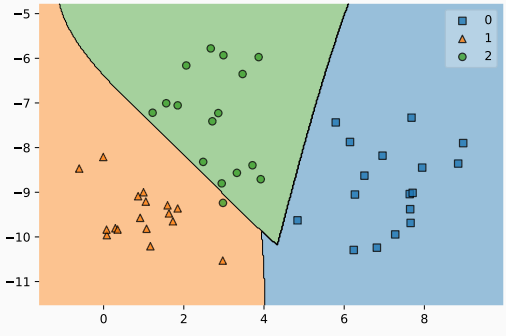
Data Visualisation



Why Visualise?

- Our visual system is so great!

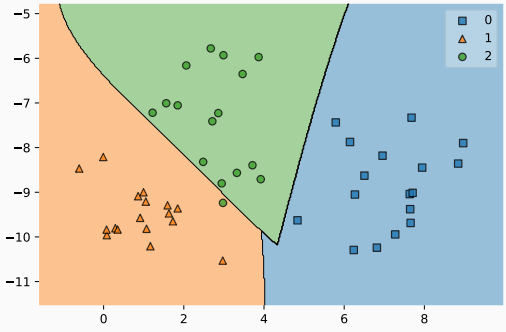
Data Visualisation



Why Visualise?

- Our visual system is so great!
- A much better way to represent data than statistical values

Data Visualisation



Why Visualise?

- Our visual system is so great!
- A much better way to represent data than statistical values
- Meaningful plots show meaningful insights without needing to do much

The Datasaurus Dozen

https://www.autodeskresearch.com/publications/samestats

Matplotlib


matplotlib

Matplotlib

- feature-rich plotting library in python

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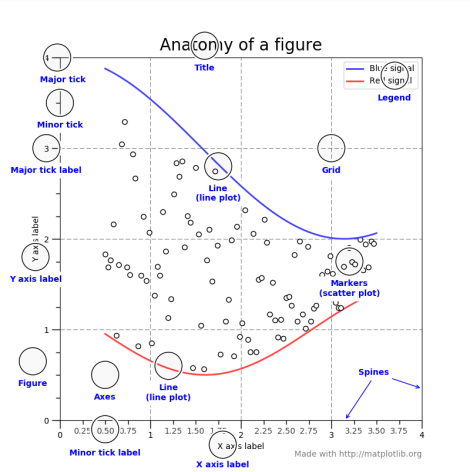
- extensive support for jupyter notebook

Matplotlib



Source: `https://matplotlib.org/tutorials/introductory/usage.html`

Let’s go to Notebook!

Blending it all together

Demo