Python for Data Science

Sirakorn Lamyai

September 19, 2019

Student, Kasetsart U.

Obtain the material

http://bit.ly/cpe-datascience

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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- **Scrub**, sanitise, and clean the data into machine-understandable formats

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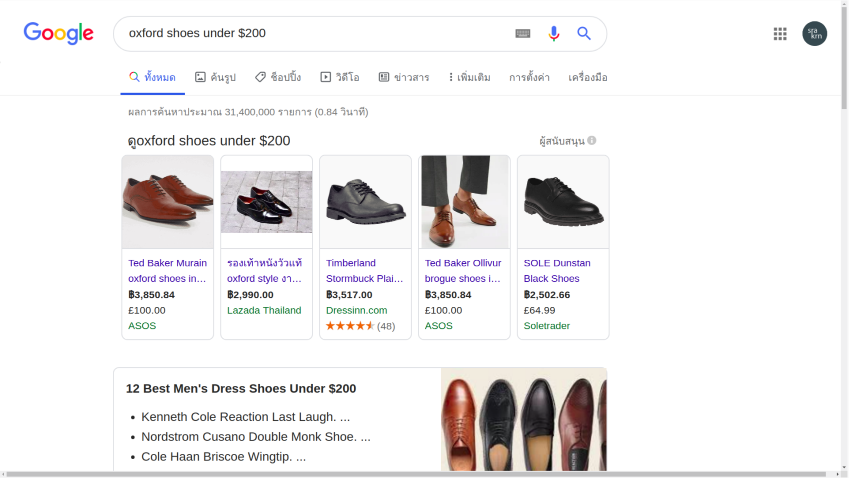
- **iNterpret** and use the results obtained
- **Interate** and rethink about your outputs

Why data?



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ดูoxford shoes under $200

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฿3,850.84
£100.00
ASOS

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★★★★★ (48)

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Soletrader

12 Best Men's Dress Shoes Under $200

- Kenneth Cole Reaction Last Laugh. ...
- Nordstrom Cusano Double Monk Shoe. ...
- Cole Haan Briscoe Wingtip. ...

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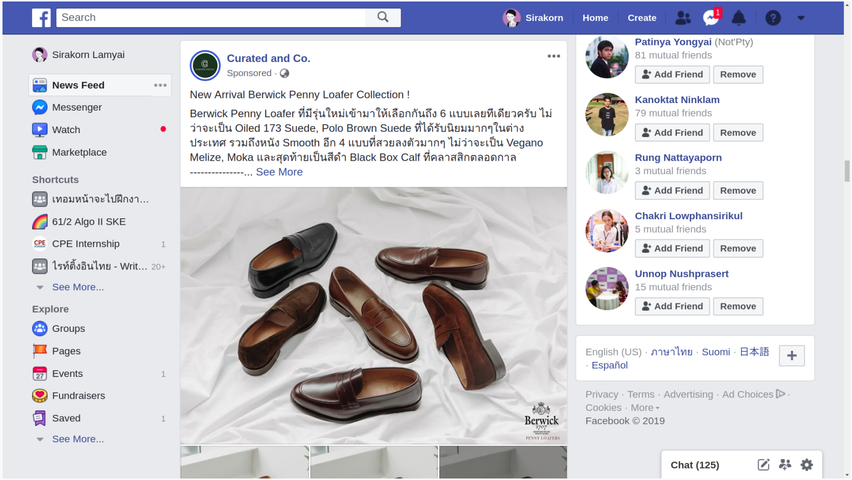

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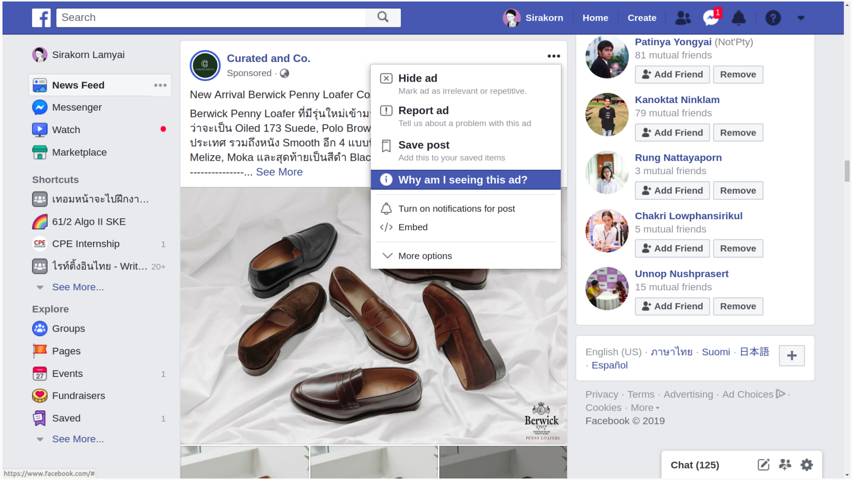
Berwick Penny Loafer ที่มีรุ่นใหม่เข้ามาให้เลือกกันถึง 6 แบบเลยทีเดียวครับ ไม่ว่าจะเป็น Oiled 173 Suede, Polo Brown Suede ที่ได้รับนิยมมากๆในต่างประเทศ รวมถึงหนัง Smooth อีก 4 แบบที่สวยลงตัวมากๆ ไม่ว่าจะเป็น Vegano Melize, Moka และสุดท้ายเป็นสีดำ Black Box Calf ที่คลาสสิกตลอดกาล ----------------... See More

Why data?



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CPE Internship 1

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New Arrival Berwick Penny Loafer Co

Berwick Penny Loafer ที่มีรุ่นใหม่เข้าม
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Melize, Moka และสุดท้ายเป็นสีดำ Blac
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More options

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 · Remove

Unnop Nushprasert
15 mutual friends
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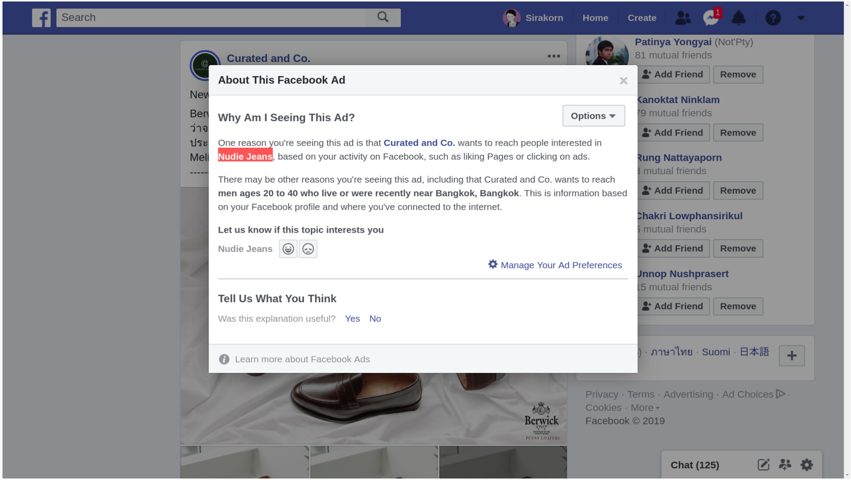
Why data?



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There may be other reasons you're seeing this ad, including that Curated and Co. wants to reach **men ages 20 to 40 who live or were recently near Bangkok, Bangkok**. This is information based on your Facebook profile and where you've connected to the internet.

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Why data?

Data is the new oil

Tools for data analysis

With GUIs

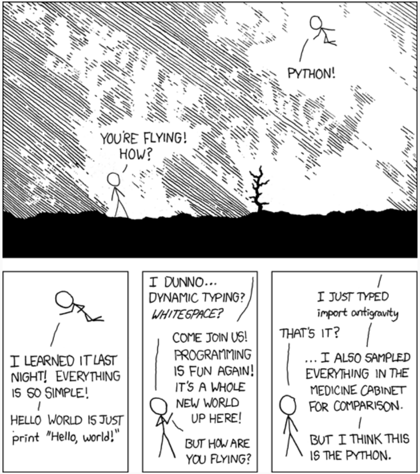
- Spreadsheets
    - Excel
    - Google Spreadsheets
    - Lotus 1-2-3
- Modelling and Visualisation
    - RapidMiner Studio
    - Weka
    - Tableau

As programming languages

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

Python

Python


YOU'RE FLYING! HOW?
PYTHON!
I LEARNED IT LAST NIGHT! EVERYTHING IS SO SIMPLE!
HELLO WORLD IS JUST print "Hello, world!"
I DUNNO... DYNAMIC TYPING? WHITESPACE?
COME JOIN US! PROGRAMMING IS FUN AGAIN! IT'S A WHOLE NEW WORLD UP HERE!
BUT HOW ARE YOU FLYING?
I JUST TYPED import antigravity
THAT'S IT?
... I ALSO SAMPLED EVERYTHING IN THE MEDICINE CABINET FOR COMPARISON.
BUT I THINK THIS IS THE PYTHON.

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

I *loved* Python...

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

Python Packages

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`pip`

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- PyPA (Python Packaging Authority)'s recommended package installer

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- Many useful packages for us to use!

Anaconda Python Distribution

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- Cross-platform Python Distribution

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Anaconda Python Distribution

- Cross-platform Python Distribution
- 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
```

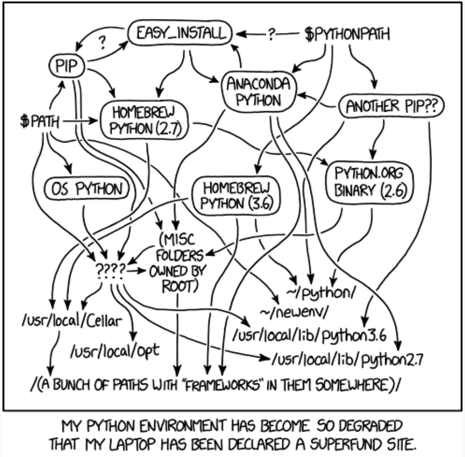
On my https://charles.srakrn.me/ server...

```
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

Jupyter

Interactive computing environment

Jupyter Notebook

Jupyter Notebook

- 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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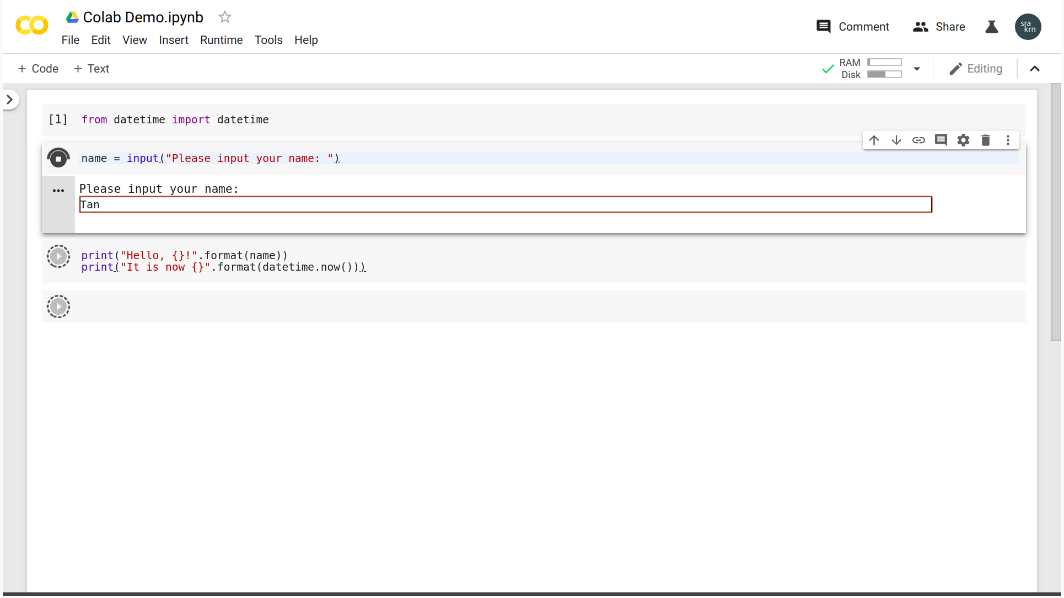
  - In other words, your code are remotely executed
- Could be more powerful for some tasks (like Deep Learning) than your computer
- Free!

Google Colaboratory (Colab)

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



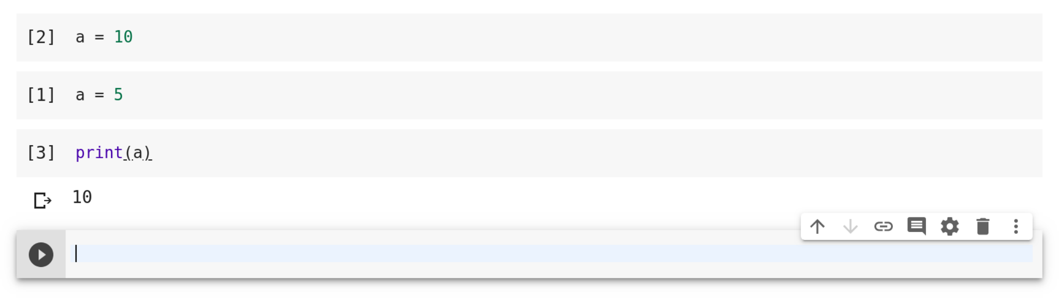
```
[1] from datetime import datetime
```

```
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



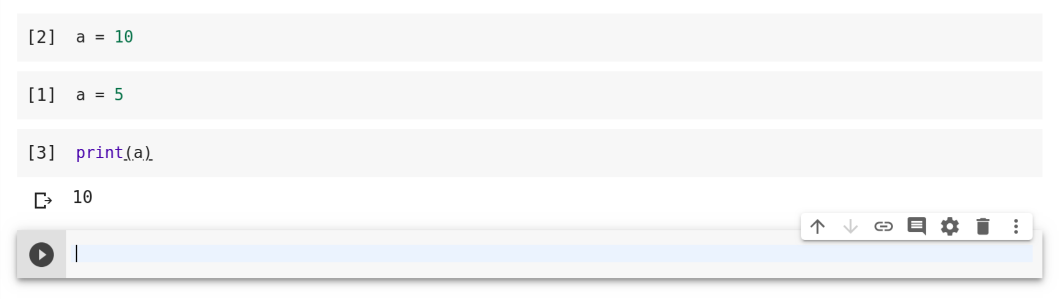
```
[2]  a = 10

[1]  a = 5

[3]  print(a)

     10
```

Caveats 1: Execution order



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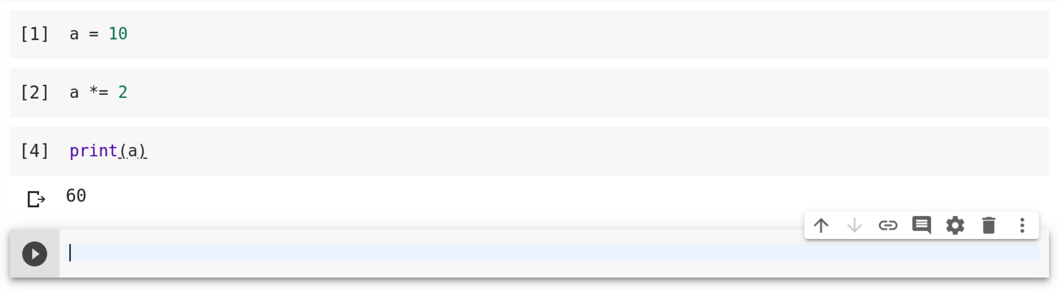
You’ll do a lot of out-of-order code execution!

Caveats 2: Cell edits



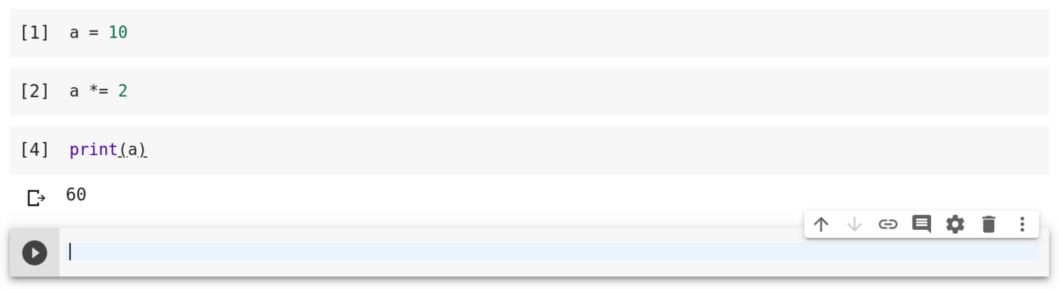
```
[1]  a = 10

[2]  a *= 2

[4]  print(a)

     60
```

Caveats 2: Cell edits



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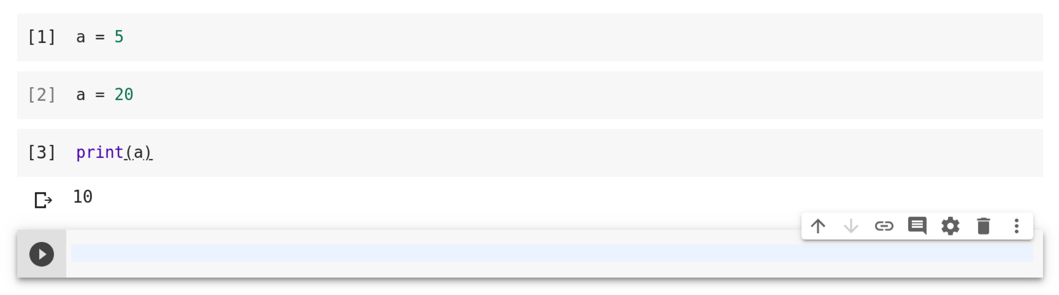
     60
```

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

Caveats 2: Cell edits



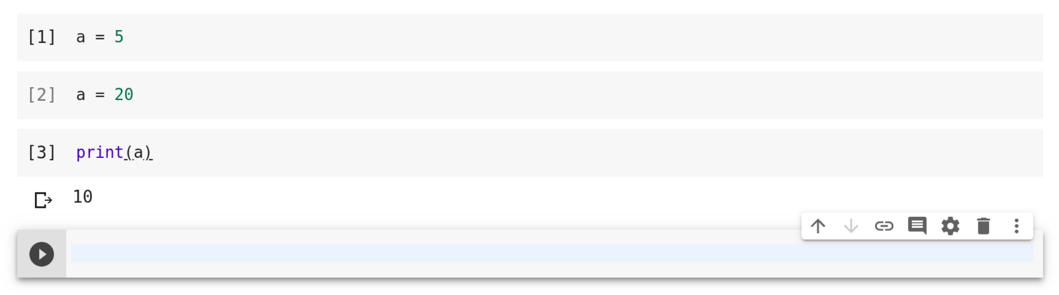
```
[1]  a = 5

[2]  a = 20

[3]  print(a)

     10
```

Caveats 2: Cell edits



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Jupyter Notebook offers no cell edited marks, while Colab offers them

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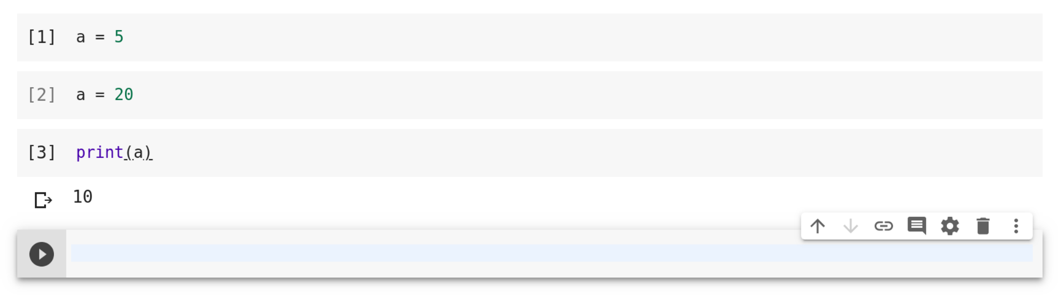

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Jupyter Notebook offers no cell edited marks, while Colab offers them (note: observe the greyed out cell number)

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

Caveats 3: Be neat and tidy

Sirakorn’s Workflow Demo

Python Data Structures

Lists

```python
a = [1, 2, 3, 4, 5]
b = ["Cats", "Dogs", "Penguins", "Tonkatsu Pieces"]
c = [1, "1", True]
```

Lists

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- **Lists** are a compilation of objects.

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```

- **Lists** are a compilation of objects.
- Can store multiple data types.
    - This includes storing lists in a list
    - So-called a **nested list**
- Can be resized.
    - No need to declare its size on the first declaration.

Lists

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

Accessing list

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Accessing list

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

Lists

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a[1:3]  # Slicing
```

Accessing list

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

List Functions

```python
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

```python
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

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

kami_nickname = names["Manipa"]
```

Dictionary

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- **Dictionaries** store values in a **key-pair** format.

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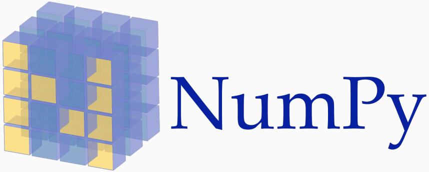
```

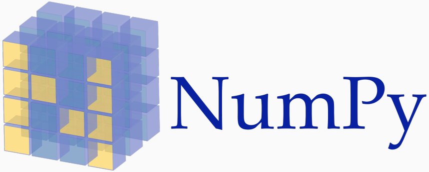
- **Dictionaries** store values in a **key-pair** format.
- From the positional index, dictionary takes the key as an index instead.

NumPy

NumPy

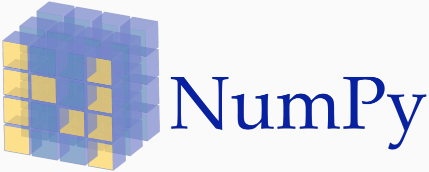


NumPy



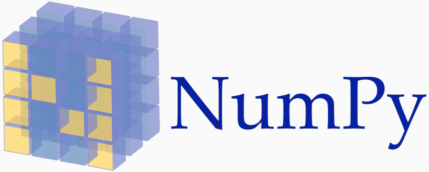
- NumPy is a powerful library for mathematical computation in Python

NumPy



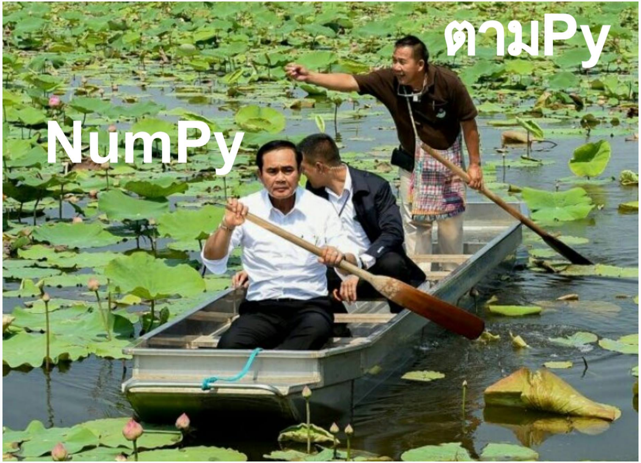
- NumPy is a powerful library for mathematical computation in Python
- It offers wide range of tools from data structures to advanced functions and operations

NumPy



- 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!**

NumPy



Courtesy: Rebellious Professor,

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

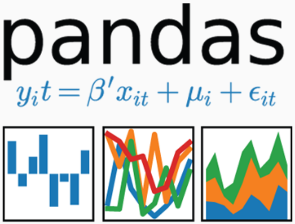
Let’s go to Notebook!

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

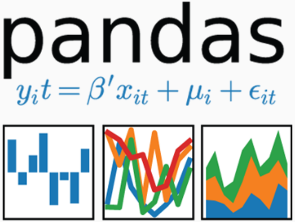
Pandas

Pandas

Pandas

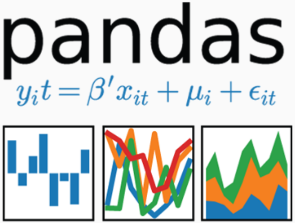


Pandas



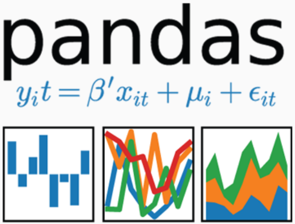
- Tabular-like structure

Pandas



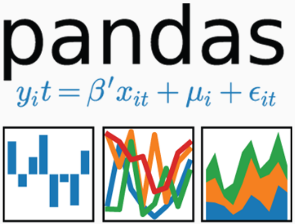
- Tabular-like structure
- High performance

Pandas



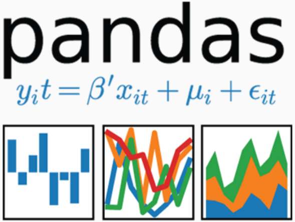
- Tabular-like structure
- High performance
- Easy to use

Pandas



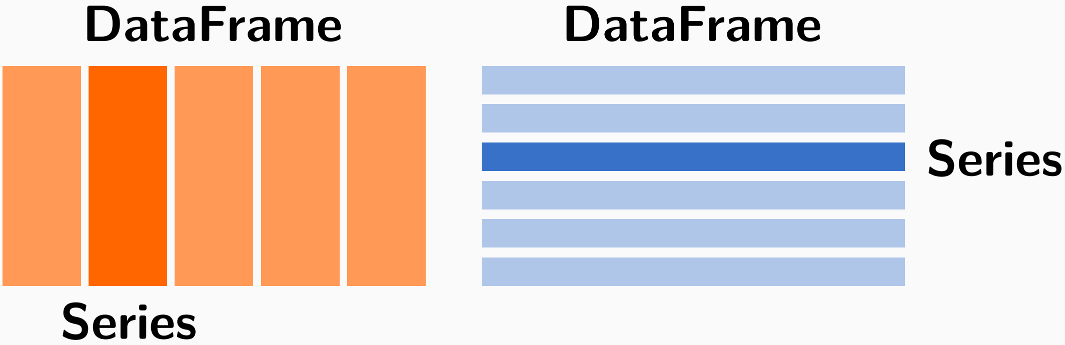
- Tabular-like structure
- High performance
- Easy to use
- Helps a lot in data preparation

Pandas



- 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

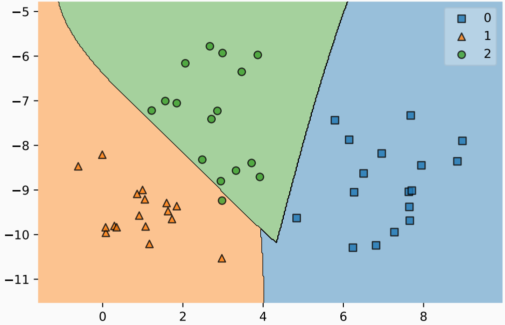


Pandas

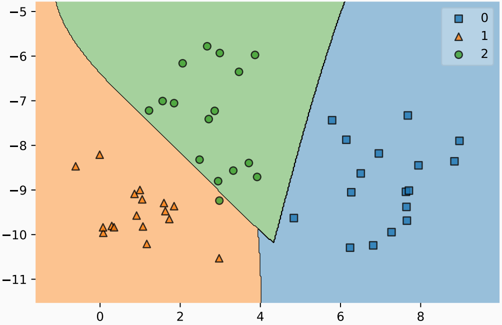
Let’s go to Notebook!

Data Visualisation

Data Visualisation

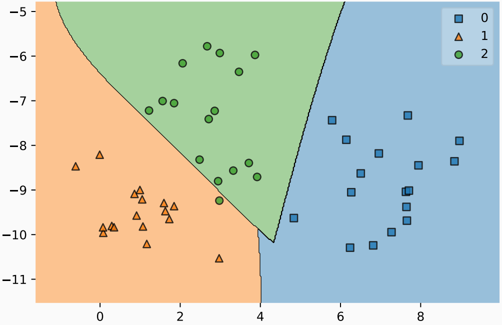


Data Visualisation



Why Visualise?

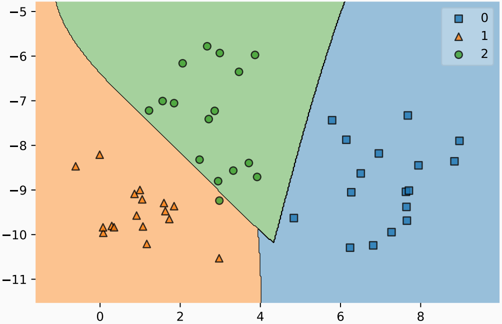
Data Visualisation



Why Visualise?

- Our visual system is so great!

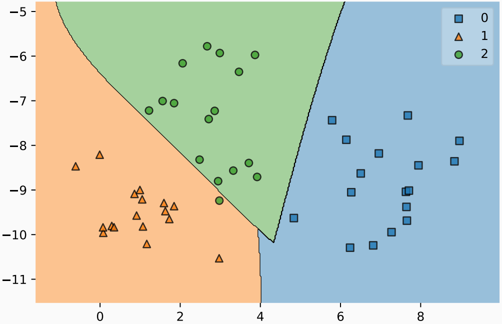
Data Visualisation



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

What if we don’t visualise?

The Datasaurus Dozen

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

Matplotlib

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- feature-rich plotting library in python

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- plots multiple types of charts

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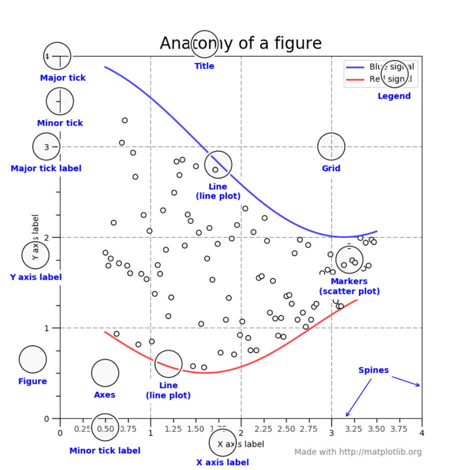
- extensive support for jupyter notebook

Matplotlib



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

Matplotlib

Let’s go to Notebook!

Blending it all together

Demo