Python for Data Science

Sirakorn Lamyai

September 17, 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

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

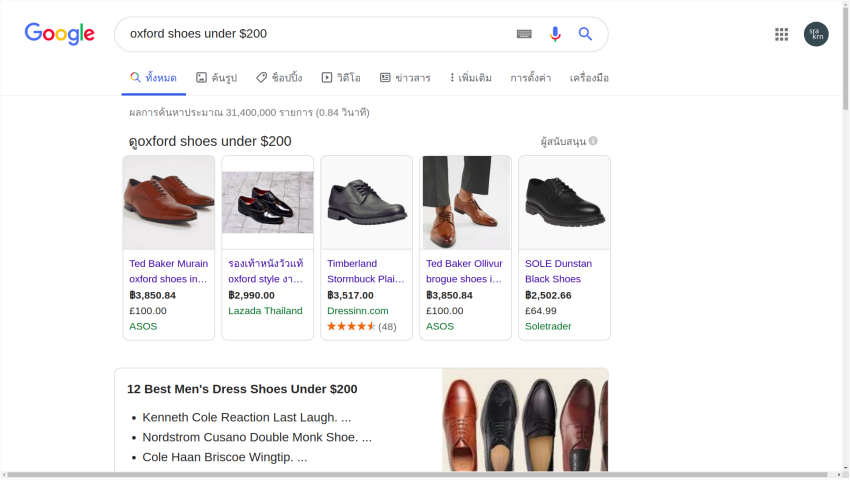
Pandas

Data Science

The Data Science Process: OSEMNI

- **Obtain** data from relevent sources
- **Scrub**, sanitise, and clean the data into machine-understandable formats
- **Explore** significant and meaningful patterns with statistical methods
- **Model** construction for prediction and forecast
- **iNterpret** and use the results obtained
- **Interate** and rethink about your outputs

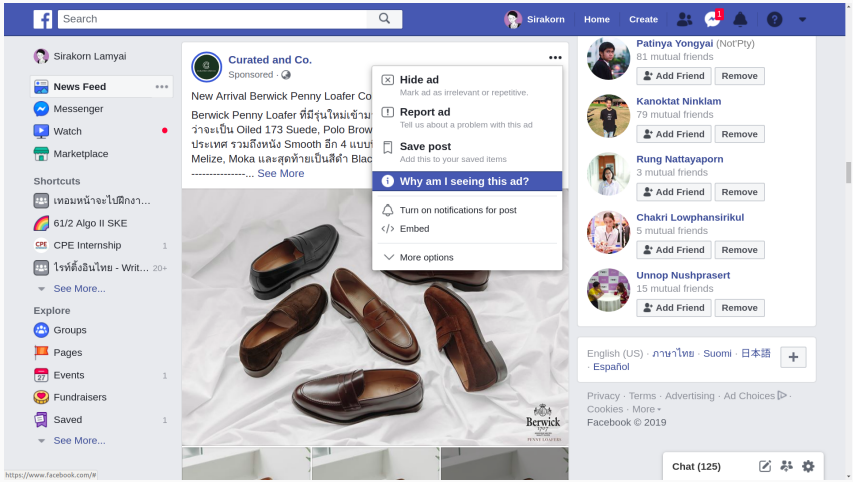
Why data?


Google
oxford shoes under $200
ทั้งหมด
ค้นรูป
ช็อปปิ้ง
วิดีโอ
ข่าวสาร
เพิ่มเติม
การตั้งค่า
เครื่องมือ
ผลการค้นหาประมาณ 31,400,000 รายการ (0.84 วินาที)
ดูoxford shoes under $200
ผู้สนับสนุน
Ted Baker Murain oxford shoes in…
฿3,850.84
£100.00
ASOS
รองเท้าหนังวัวแท้ oxford style งา…
฿2,990.00
Lazada Thailand
Timberland Stormbuck Plai…
฿3,517.00
Dressinn.com
(48)
Ted Baker Ollivur brogue shoes i…
฿3,850.84
£100.00
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. ...

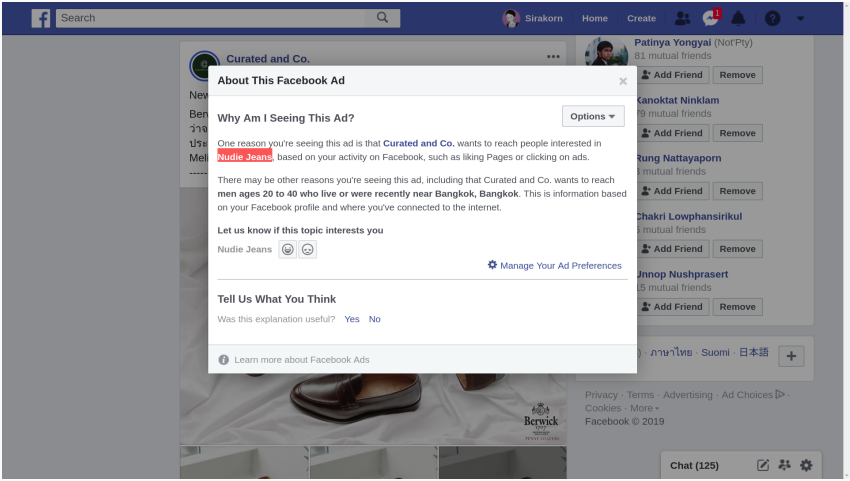
Why data?


Search
Sirakorn
Home
Create
Sirakorn Lamyai
News Feed
Messenger
Watch
Marketplace
Shortcuts
เทอมหน้าจะไปฝึกงา...
61/2 Algo II SKE
CPE Internship
ไรท์ดิ้งอินไทย - Writ...
See More...
Explore
Groups
Pages
Events
Fundraisers
Saved
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
Remove
Unnop Nushprasert
15 mutual friends
Add Friend
Remove
English (US) · ภาษาไทย · Suomi · 日本語 · Español
Privacy · Terms · Advertising · Ad Choices · Cookies · More
Facebook © 2019
Chat (125)

Why data?


Search
Sirakorn
Home
Create
Sirakorn Lamyai
News Feed
Messenger
Watch
Marketplace
Shortcuts
เทอมหน้าจะไปฝึกงา...
61/2 Algo II SKE
CPE Internship
ไรท์ดิ้งอินไทย - Writ...
See More...
Explore
Groups
Pages
Events
Fundraisers
Saved
See More...
Curated and Co.
Sponsored
New Arrival Berwick Penny Loafer Co
Berwick Penny Loafer ที่มีรุ่นใหม่เข้ามา
ว่าจะเป็น Oiled 173 Suede, Polo Brow
ประเทศ รวมถึงหนัง Smooth อีก 4 แบบ
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
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
Remove
Unnop Nushprasert
15 mutual friends
Add Friend
Remove
English (US) · ภาษาไทย · Suomi · 日本語 · Español
Privacy · Terms · Advertising · Ad Choices · Cookies · More
Facebook © 2019
Chat (125)
https://www.facebook.com/#

Why data?


Search
Sirakorn
Home
Create
Curated and Co.
About This Facebook Ad
Why Am I Seeing This Ad?
Options
One reason you're seeing this ad is that Curated and Co. wants to reach people interested in Nudie Jeans, based on your activity on Facebook, such as liking Pages or clicking on ads.
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.
Let us know if this topic interests you
Nudie Jeans
Manage Your Ad Preferences
Tell Us What You Think
Was this explanation useful? Yes No
Learn more about Facebook Ads
Patinya Yongyai (Not'Pty)
81 mutual friends
Add Friend
Remove
Kanoktat Ninklam
79 mutual friends
Rung Nattayaporn
Chakri Lowphansirikul
Unnop Nushprasert
15 mutual friends
Berwick
Privacy · Terms · Advertising · Ad Choices
Cookies · More
Facebook © 2019
Chat (125)

Data is the new oil

Tools for data analysis

With GUIs

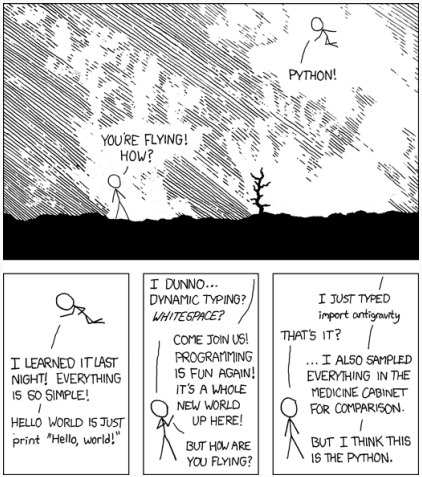
- Spreadsheets
  - Excel
  - Google Spreadsheets
  - Lotus 1-2-3
- Modelling and Visualisation
  - RapidMiner Studio
  - Weka
  - Tableau

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

Python Packages

`pip`

- **PyPA** (**Py**thon **P**ackaging **A**uthority)'s recommended package installer
- Obtains packages from **PyPI** (**Py**thon **P**ackaging **I**ndex)

Python Packages

`pip`

- **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

Anaconda Python Distribution

Anaconda Python Distribution

- Cross-platform Python Distribution

Anaconda Python Distribution

- Cross-platform Python Distribution
- Ships with its own package and environment manager

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

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

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

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
```

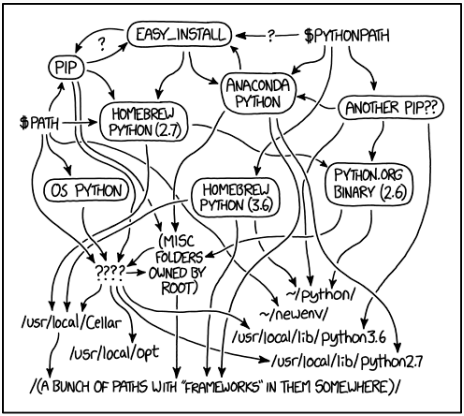
On my https://charles.srakrn.me/ server...

```
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

Interactive computing environment

Jupyter Notebook

Jupyter Notebook

- Thinks of a more *dynamic* coding environment.

Jupyter Notebook

- Thinks of a more *dynamic* coding environment.
- Inserts snippets of codes alternately with texts, maths, and images.

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)

Google Colaboratory (Colab)

Google Colaboratory (Colab)

- Think of an online Jupyter Notebook provided by Google

Google Colaboratory (Colab)

- Think of an online Jupyter Notebook provided by Google
- The runtime relies on Google's server fram

Google Colaboratory (Colab)

- Think of an online Jupyter Notebook provided by Google
- The runtime relies on Google's server fram
  - In other words, your code are remotely executed

Google Colaboratory (Colab)

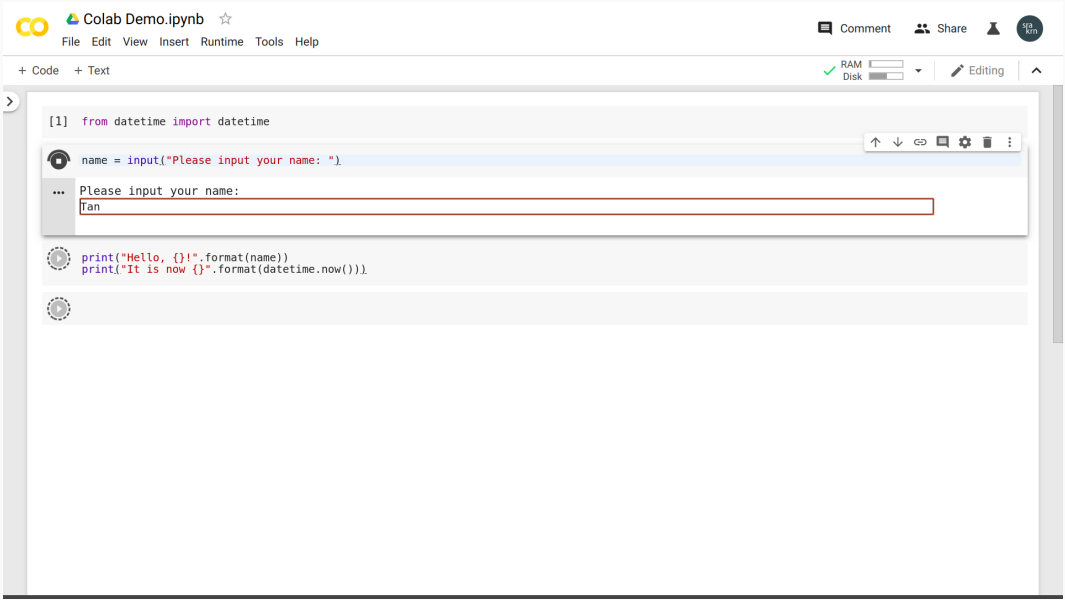
- Think of an online Jupyter Notebook provided by Google
- The runtime relies on Google's server fram
  - In other words, your code are remotely executed
- Could be more powerful for some tasks (like Deep Learning) than your computer

Google Colaboratory (Colab)

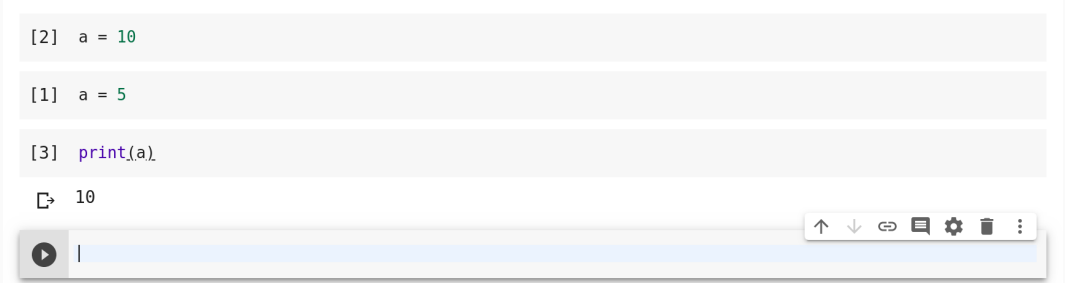
- Think of an online Jupyter Notebook provided by Google
- The runtime relies on Google's server fram
  - In other words, your code are remotely executed
- Could be more powerful for some tasks (like Deep Learning) than your computer
- Free!

Google Colaboratory (Colab)

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


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()))

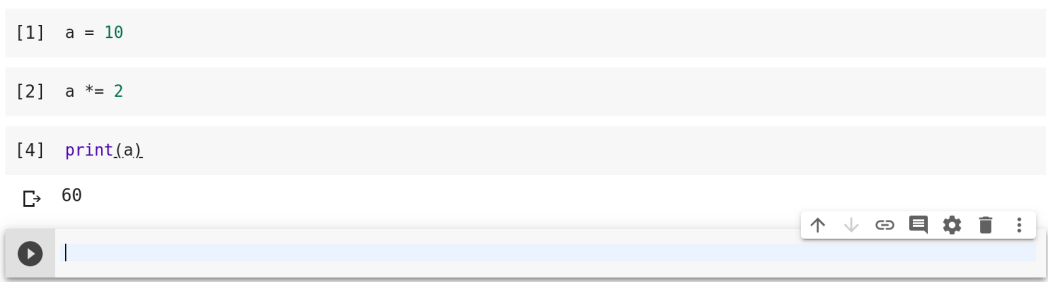
Caveats 1: Execution order



Caveats 1: Execution order

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.

Caveats 2: Cell edits

Caveats 2: Cell edits

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

Caveats 2: Cell edits

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

Sirakorn's Workflow Demo

*(Please don't be amused, this is **very** normal.)*

Python Data Structures

Lists

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

Lists

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

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

Lists

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

- **Lists** are a compilation of objects.
- Can store multiple data types.

Lists

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

- **Lists** are a compilation of objects.
- Can store multiple data types.
  - This includes storing lists in a list

Lists

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

- **Lists** are a compilation of objects.
- Can store multiple data types.
  - This includes storing lists in a list
  - So-called a **nested list**

Lists

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

- **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.

Lists

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

- **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

Accessing list

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

Lists

Accessing list

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

Lists

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

Accessing list

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

Lists

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

Dictionary

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

kami_nickname = names["Manipa"]
```

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

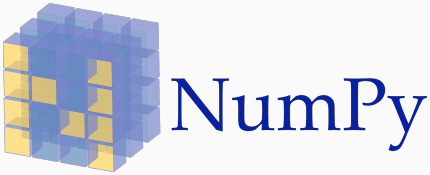
Dictionary

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

kami_nickname = names["Manipa"]
```

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

NumPy


NumPy

NumPy

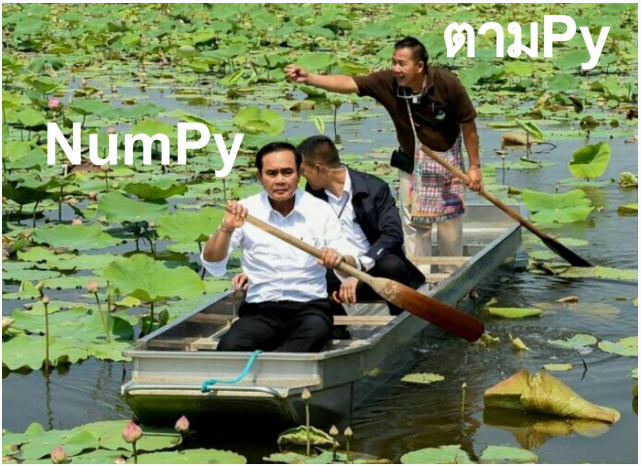
- NumPy is a powerful library for mathematical computation in Python

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!**



Courtesy: Rebellious Professor,

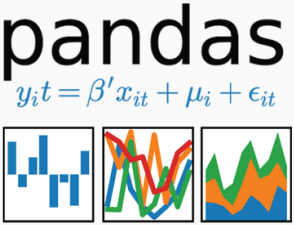
https://www.facebook.com/rebelliousprof/photos/a.301217273588245/599669117076391/

Let's go to Notebook!

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

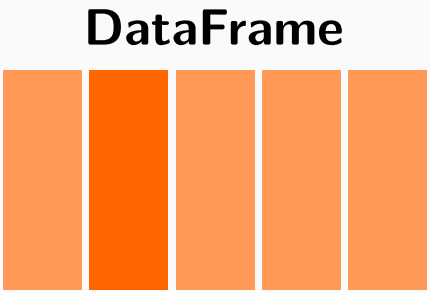
Pandas

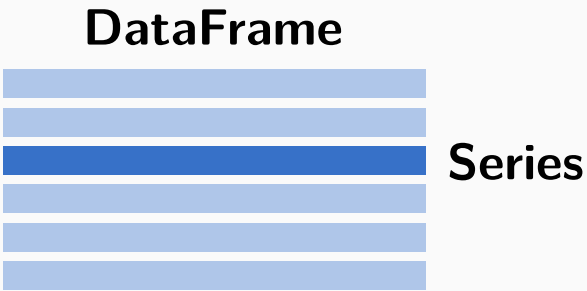
Pandas



- 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

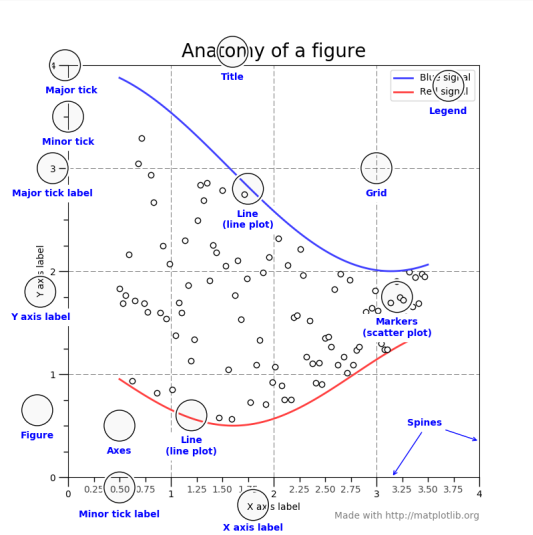
Series and DataFrame





Let's go to Notebook!

Matplotlib


Anatomy of a figure
Title
Major tick
Minor tick
Major tick label
Legend
Grid
Line
(line plot)
Y axis label
Markers
(scatter plot)
Figure
Axes
Line
(line plot)
Spines
Minor tick label
X axis label
Made with http://matplotlib.org