



Faculty of Science
Srinakharinwirot University

เรียน AI แล้วไปสร้างเกม

- เรียน AI
- สร้างเกม



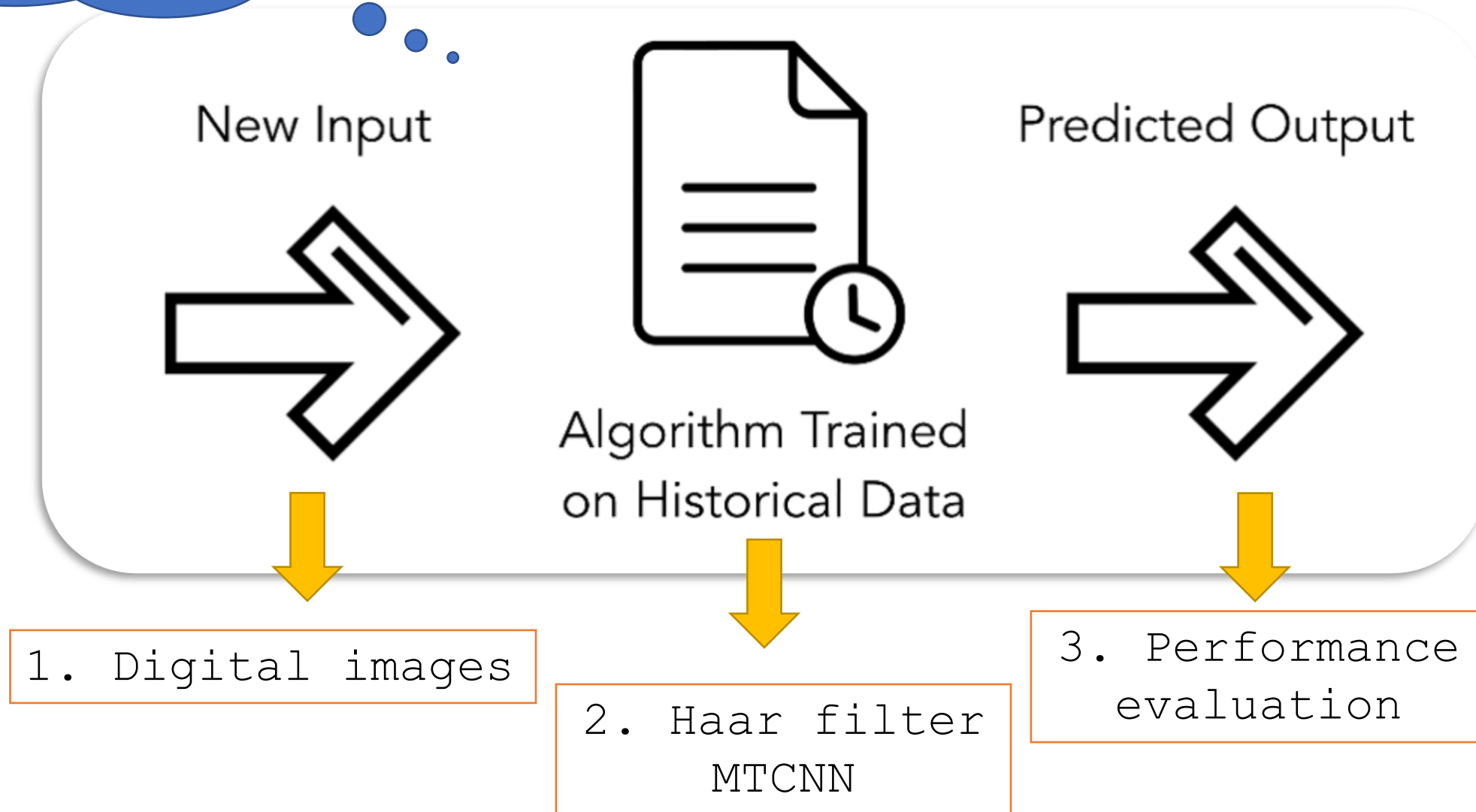
ภาควิชาวิทยาการคอมพิวเตอร์

คณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ

เรียนรู้ AI จดจำใบหน้า Face detection

อ. นภา แซ่เป้, ผศ. ศศิวิมล สุขพัฒน์, อ. เรืองศักดิ์ เจริญพุทธรักษา

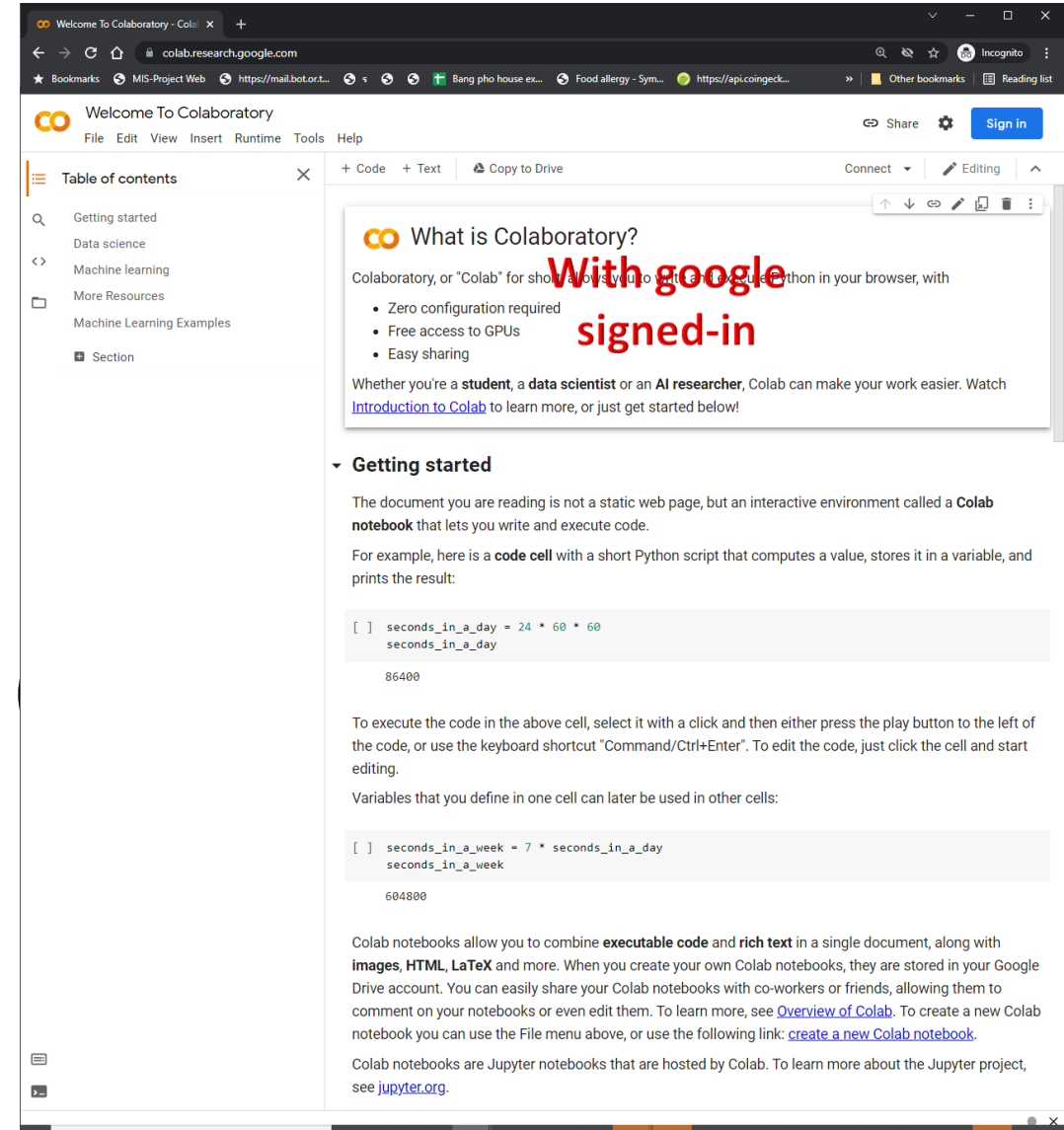
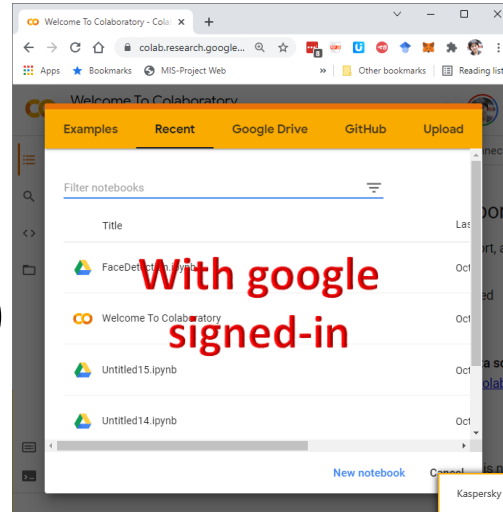
How AI works



Google-colab introduction

- <https://colab.research.google.com/>

Colab allows anybody to write and execute arbitrary python code through the browser





New notebook

The screenshot shows the Google Colaboratory web interface. The browser address bar displays `colab.research.google.com`. The main header includes the Colab logo, the text "Welcome To Colaboratory", and navigation links: File, Edit, View, Insert, Runtime, Tools, and Help. A "Sign in" button is also present. On the left, a "Table of contents" sidebar lists various resources. The central workspace displays a "What is Colaboratory?" introductory page. A "File" menu is open, showing options like "New notebook", "Open notebook", "Upload notebook", "Rename notebook", "Move to trash", "Save a copy in Drive", "Save a copy as a GitHub Gist", and "Save a copy in GitHub". The "New notebook" option is circled in red.

Welcome To Colaboratory

File Edit View Insert Runtime Tools Help

Share Sign in

Table of contents

- Getting started
- Data science
- Machine learning
- More Resources
- Machine Learning Examples
- Section

What is Colaboratory?

Colaboratory, or "Colab" for short, allows you to write and execute Python in your browser.

- Zero configuration required
- Free access to GPUs
- Easy sharing

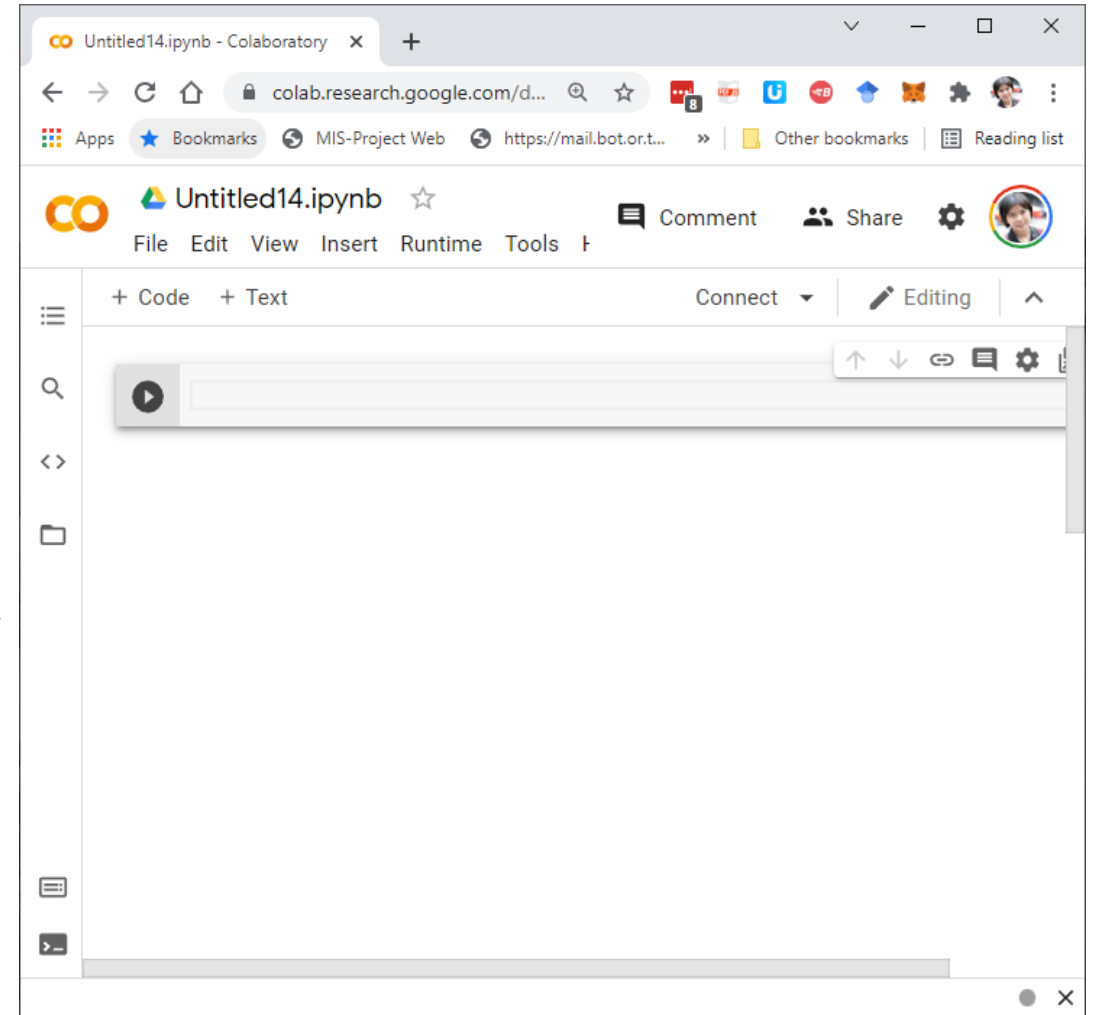
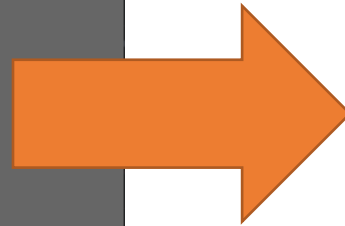
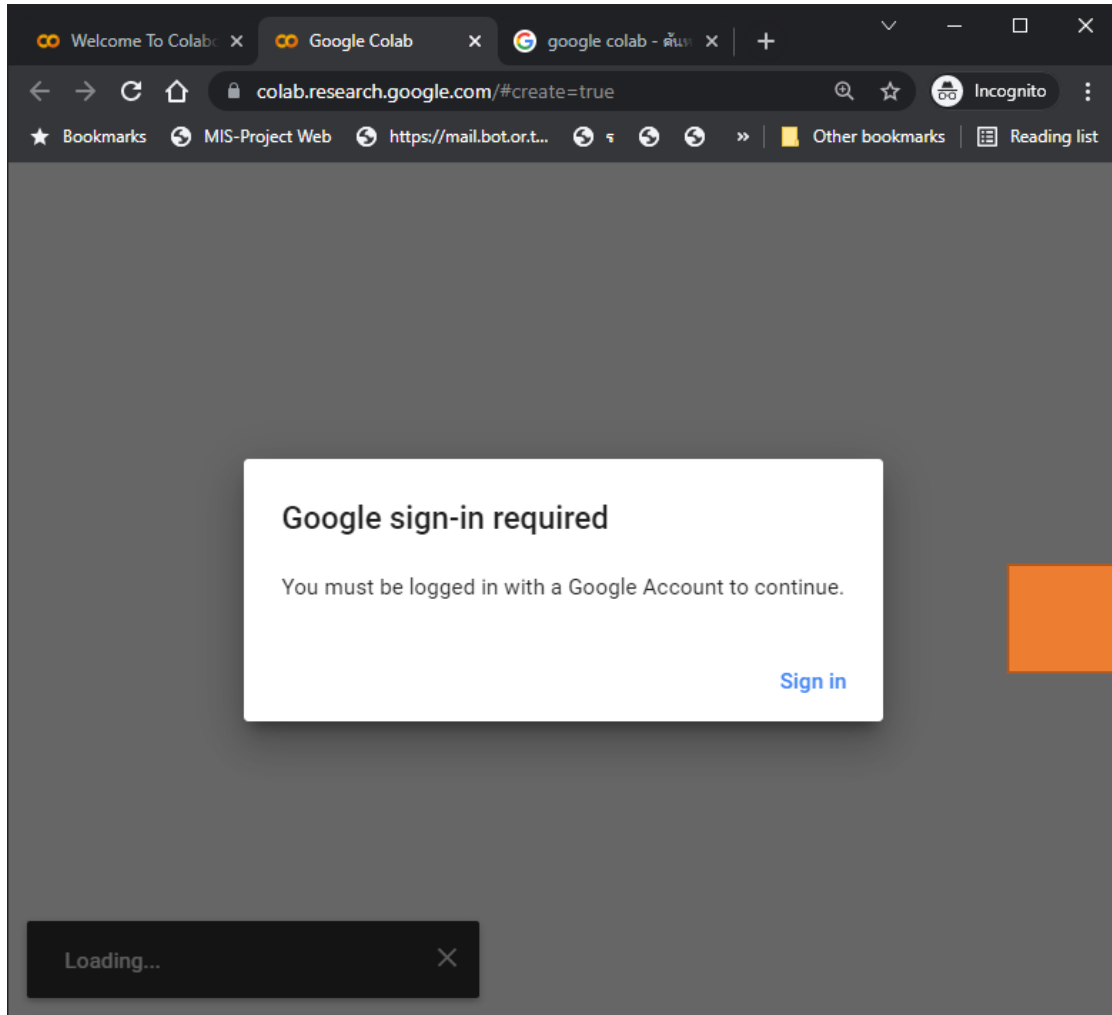
Whether you're a **student**, a **data scientist** or an **AI researcher**, Colab can make your work easier. [Introduction to Colab](#) to learn more, or just get started below!

Getting started

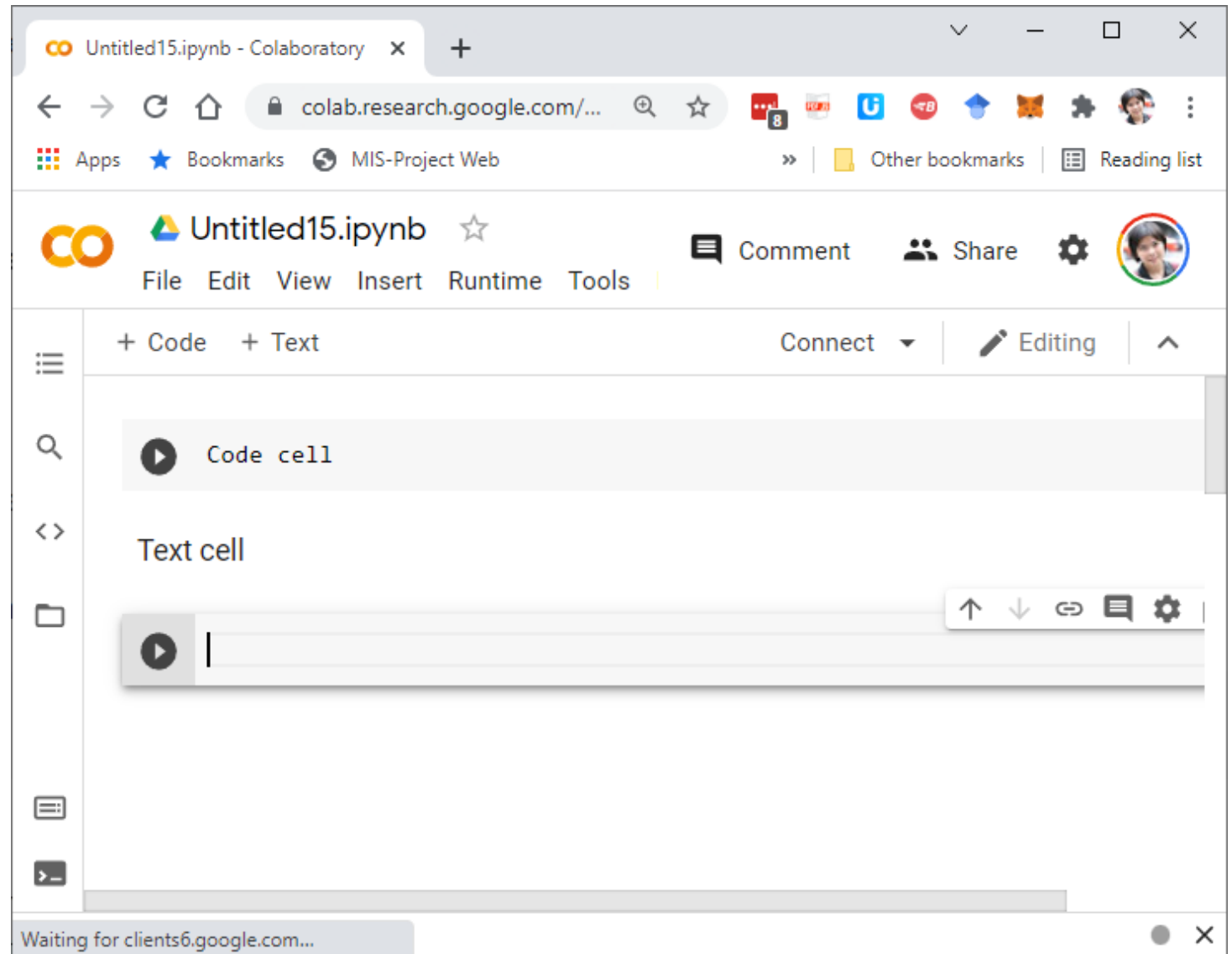
File Edit View Insert Runtime Tools Help

- New notebook
- Open notebook ⌘/Ctrl+O
- Upload notebook
- Rename notebook
- Move to trash
- Save a copy in Drive
- Save a copy as a GitHub Gist
- Save a copy in GitHub

To execute python code in google colab ,
users are required to sign-in to google account first.



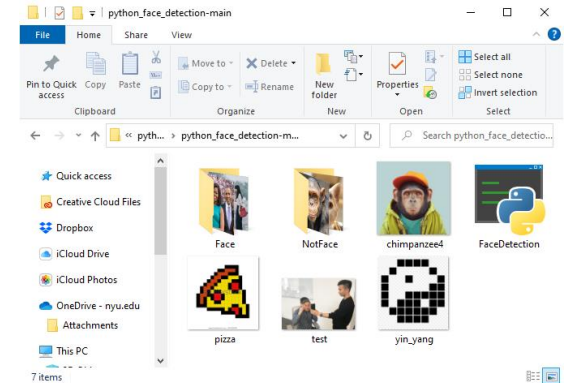
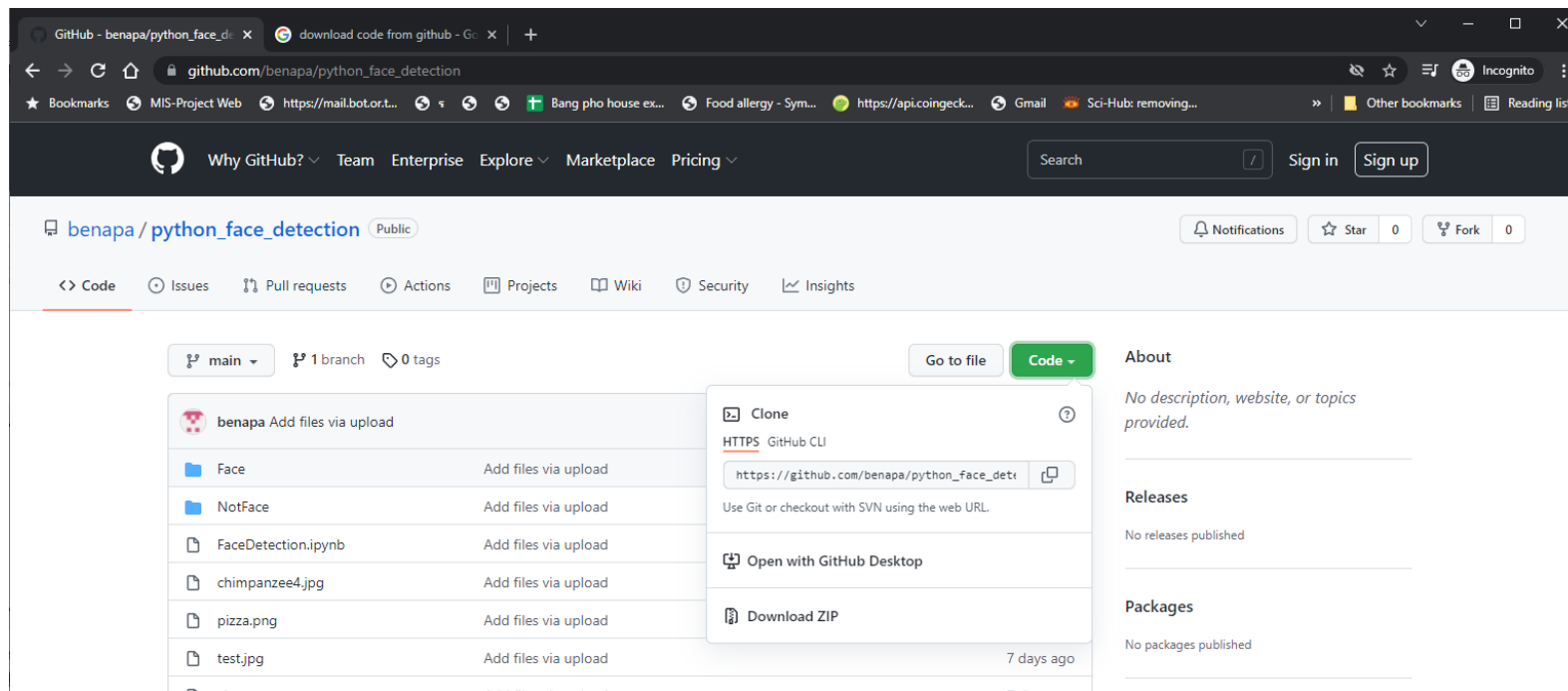
-
- Colab notebooks allow combination of
 - **executable code** and
 - **rich text**in a single document





Get all files (*.zip) from github

- Go to: https://github.com/benapa/python_face_detection
- Unzip all files



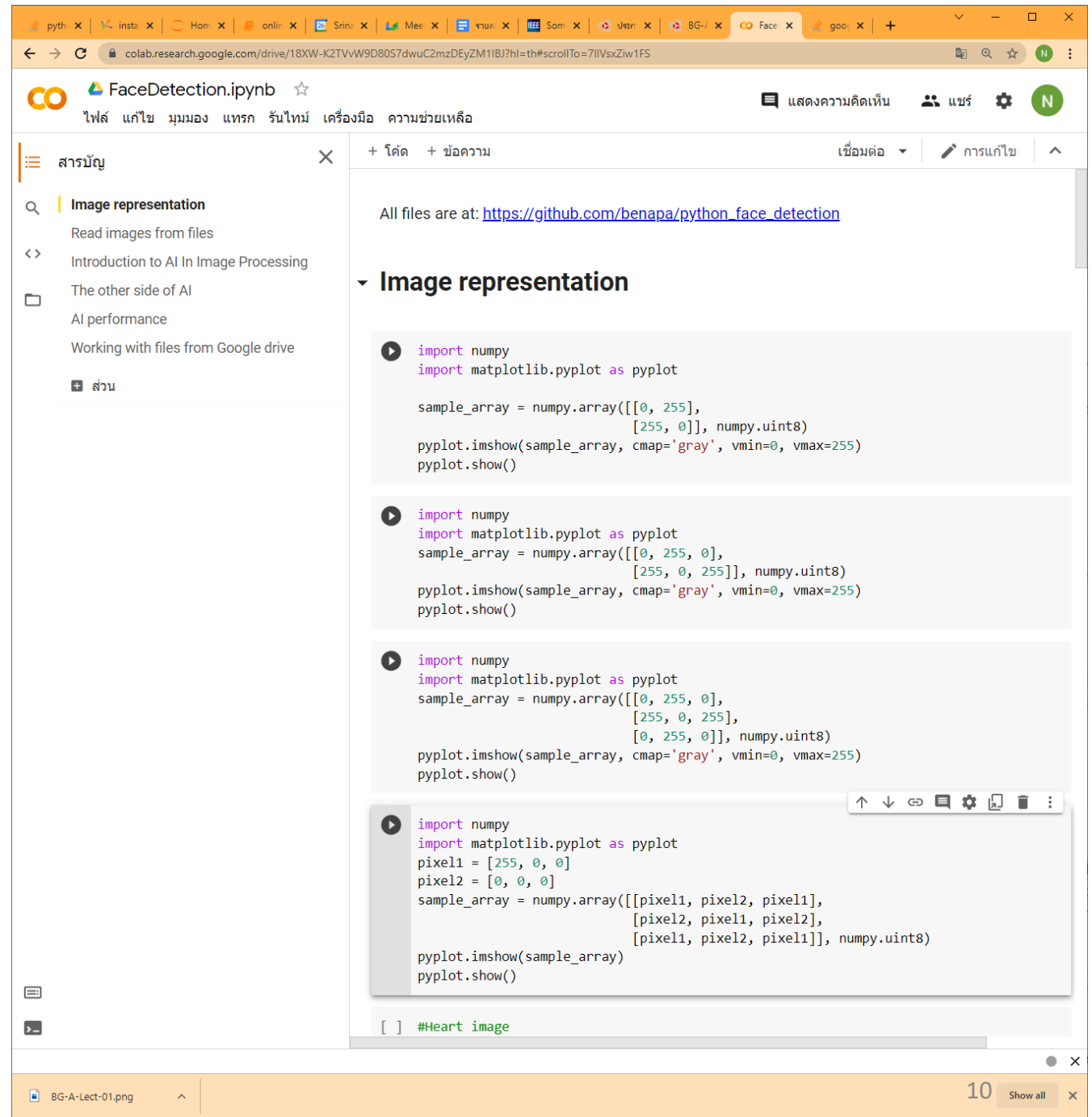


Upload notebook to colab

The image shows a web browser window displaying the Google Colaboratory (Colab) interface. The browser's address bar shows the URL `colab.research.google.com`. The Colab interface includes a top navigation bar with 'Welcome To Colaboratory', 'File', 'Edit', 'View', 'Insert', 'Runtime', 'Tools', and 'Help' menus. A 'Sign in' button is visible in the top right. On the left, there is a 'Table of contents' sidebar with links to 'Getting started', 'Data science', 'Machine learning', 'More Resources', and 'Machine Learning Examples'. The main content area displays a 'What is Colaboratory?' section, explaining that Colab allows writing and executing Python in the browser, with features like zero configuration, free GPU access, and easy sharing. Below this, the 'Getting started' section is partially visible. A 'File' menu is open, showing options: 'New notebook', 'Open notebook' (with a keyboard shortcut ⌘/Ctrl+O), 'Upload notebook' (highlighted), 'Rename notebook', and 'Move to trash'. The 'Upload notebook' option is the focus of the tutorial.

1. Upload

“FaceDetection.ipynb”



The screenshot shows a Google Colab notebook interface. The browser tabs at the top include 'pyth', 'insta', 'Hom', 'onli', 'Srin', 'Mee', 'Som', 'Utr', 'BG-', 'Face', 'goc', and a plus sign for more. The address bar shows the URL 'colab.research.google.com/drive/18XW-K2TVvW9D80S7dWuC2mzDEyZM1BJ?hl=th#scrollTo=7lIVsxZiw1FS'. The notebook title is 'FaceDetection.ipynb' with a star icon. Below the title, there are links for 'ไฟล์', 'แก้ไข', 'มุมมอง', 'แทรก', 'รันใหม่', 'เครื่องมือ', and 'ความช่วยเหลือ'. On the left sidebar, there is a search icon and a list of files: 'Image representation', 'Read images from files', 'Introduction to AI In Image Processing', 'The other side of AI', 'AI performance', 'Working with files from Google drive', and a '+ ส่วน' button. The main area of the notebook contains four code cells, each starting with a play button icon. The first three cells are for image representation using numpy and matplotlib. The fourth cell is for creating a heart image. The output area at the bottom shows a file named 'BG-A-Lect-01.png' and a page number '10' with a 'Show all' button.

FaceDetection.ipynb

ไฟล์ แก้ไข มุมมอง แทรก รันใหม่ เครื่องมือ ความช่วยเหลือ

Image representation

Read images from files

Introduction to AI In Image Processing

The other side of AI

AI performance

Working with files from Google drive

+ ส่วน

All files are at: https://github.com/benapa/python_face_detection

Image representation

```
import numpy
import matplotlib.pyplot as pyplot

sample_array = numpy.array([[0, 255],
                             [255, 0]], numpy.uint8)

pyplot.imshow(sample_array, cmap='gray', vmin=0, vmax=255)
pyplot.show()
```

```
import numpy
import matplotlib.pyplot as pyplot
sample_array = numpy.array([[0, 255, 0],
                             [255, 0, 255]], numpy.uint8)

pyplot.imshow(sample_array, cmap='gray', vmin=0, vmax=255)
pyplot.show()
```

```
import numpy
import matplotlib.pyplot as pyplot
sample_array = numpy.array([[0, 255, 0],
                             [255, 0, 255],
                             [0, 255, 0]], numpy.uint8)

pyplot.imshow(sample_array, cmap='gray', vmin=0, vmax=255)
pyplot.show()
```

```
import numpy
import matplotlib.pyplot as pyplot
pixel1 = [255, 0, 0]
pixel2 = [0, 0, 0]
sample_array = numpy.array([[pixel1, pixel2, pixel1],
                             [pixel2, pixel1, pixel2],
                             [pixel1, pixel2, pixel1]], numpy.uint8)

pyplot.imshow(sample_array)
pyplot.show()
```

[] #Heart image

BG-A-Lect-01.png

10 Show all

Image representation

2. Run the first cell

colab.research.google.com/drive/18XW-K2TVvW9D80S7dwuC2mzDEyZM1IBJ?hl=th#scrollTo=SRjyoms1wvIC

FaceDetection.ipynb

ไฟล์ แก๊ไข มุมมอง แทรก รันใหม่ เครื่องมือ ความช่วยเหลือ

สารบัญ

- Image representation
- Read images from files
- Introduction to AI In Image Processing
- The other side of AI
- AI performance
- Working with files from Google drive
- ส่วน

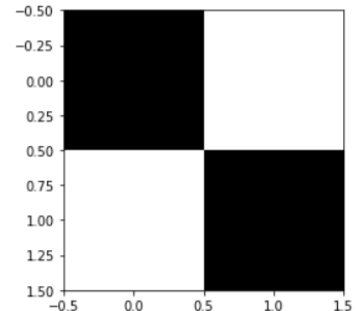
All files are at: https://github.com/benapa/python_face_detection

Image representation

```
import numpy
import matplotlib.pyplot as pyplot

sample_array = numpy.array([[0, 255],
                             [255, 0]], numpy.uint8)

pyplot.imshow(sample_array, cmap='gray', vmin=0, vmax=255)
pyplot.show()
```



```
[ ] import numpy
import matplotlib.pyplot as pyplot
sample_array = numpy.array([[0, 255, 0],
                             [255, 0, 255]], numpy.uint8)

pyplot.imshow(sample_array, cmap='gray', vmin=0, vmax=255)
pyplot.show()
```

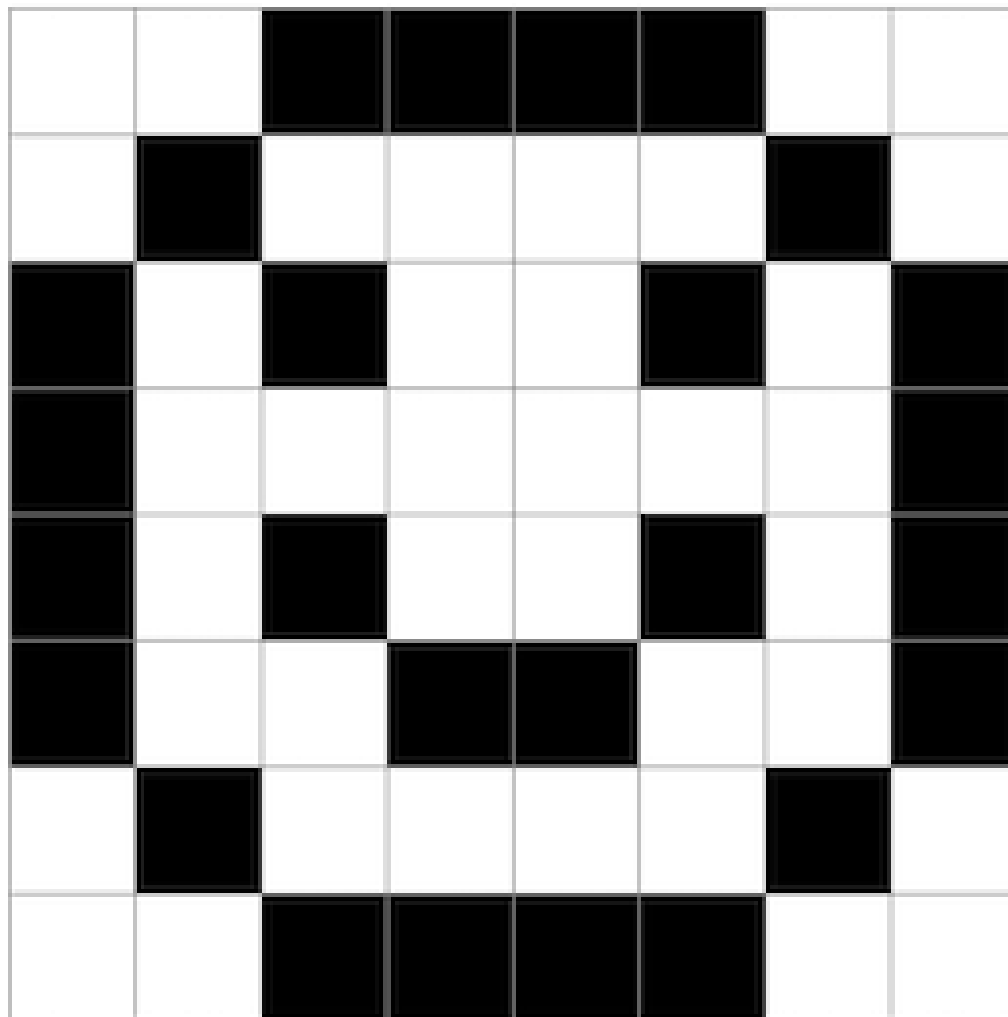
```
[ ] import numpy
import matplotlib.pyplot as pyplot
sample_array = numpy.array([[0, 255, 0],
                             [255, 0, 255],
                             [0, 255, 0]], numpy.uint8)

pyplot.imshow(sample_array, cmap='gray', vmin=0, vmax=255)
```

1 รันที่ เสร็จสมบูรณ์เมื่อ 16:21

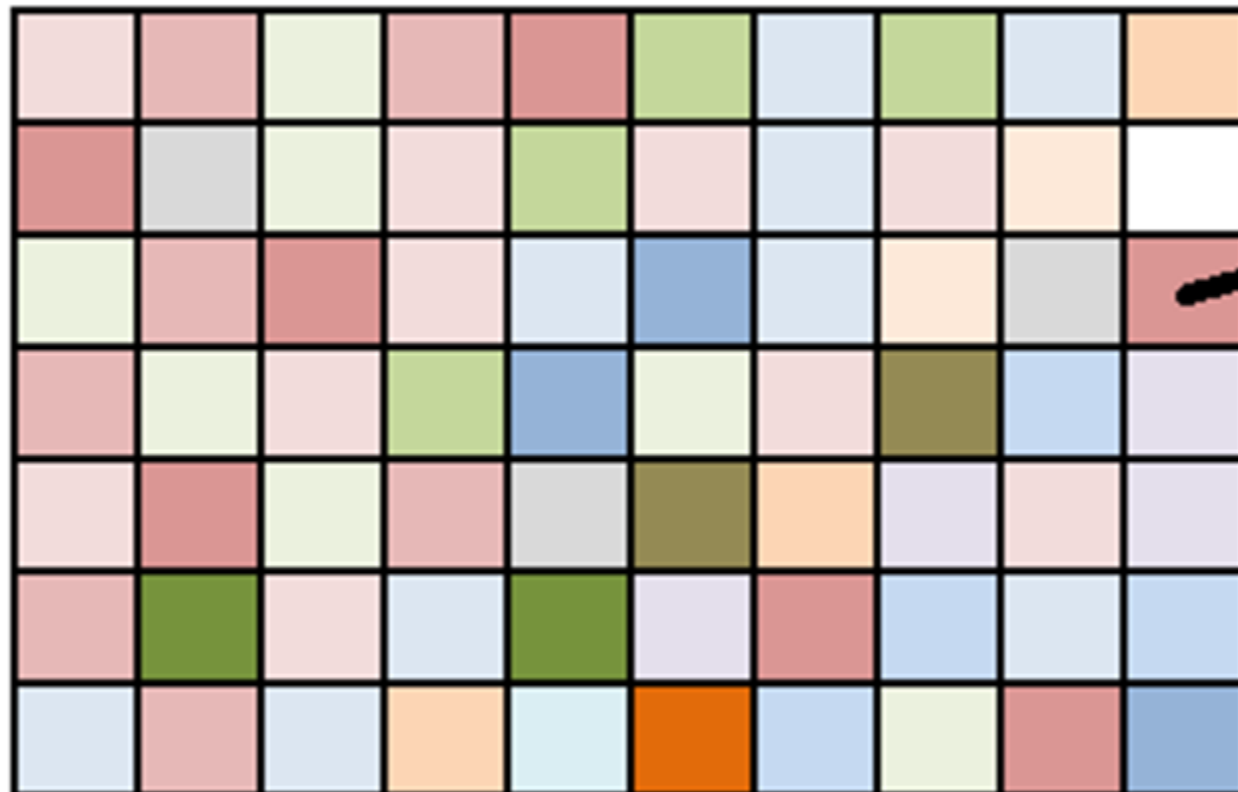
11

BG-A-Lect-01.png





Color image



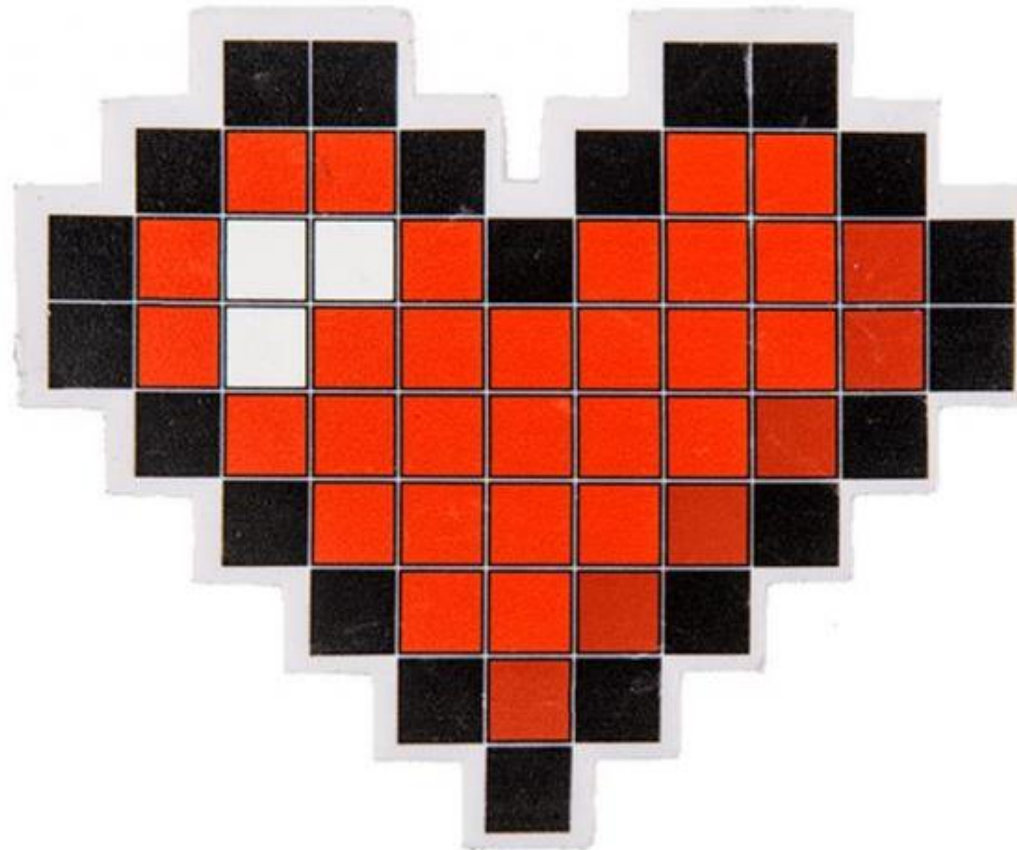
RGB (218 , 150 , 149)

ANSI / ASCII RGB Color Chart

| | | | | | |
|---------------|---------------|---------------|---------------|---------------|---------------|
| 0, 0, 0 | | | | | |
| 170, 0, 0 | 128, 0, 0 | 194, 54, 33 | 187, 0, 0 | 205, 0, 0 | 255, 0, 0 |
| 0, 170, 0 | 0, 128, 0 | 37, 188, 36 | 0, 187, 0 | 0, 205, 0 | 0, 255, 0 |
| 170, 85, 0 | 128, 128, 0 | 173, 173, 39 | 187, 187, 0 | 205, 205, 0 | 255, 255, 0 |
| 0, 0, 170 | 0, 0, 128 | 73, 46, 225 | 0, 0, 187 | 0, 0, 238 | 0, 0, 255 |
| 170, 0, 170 | 128, 0, 128 | 211, 56, 211 | 187, 0, 187 | 205, 0, 205 | 255, 0, 255 |
| 0, 170, 170 | 0, 128, 128 | 51, 187, 200 | 0, 187, 187 | 0, 205, 205 | 0, 255, 255 |
| 170, 170, 170 | 192, 192, 192 | 203, 204, 205 | 187, 187, 187 | 229, 229, 229 | |
| 85, 85, 85 | 128, 128, 128 | 129, 131, 131 | 85, 85, 85 | 127, 127, 127 | |
| 255, 85, 85 | 255, 0, 0 | 252, 57, 31 | 255, 85, 85 | 255, 0, 0 | |
| 85, 255, 85 | 0, 255, 0 | 49, 231, 34 | 85, 255, 85 | 0, 255, 0 | 144, 238, 144 |
| 255, 255, 85 | 255, 255, 0 | 234, 236, 35 | 255, 255, 85 | 255, 255, 0 | 255, 255, 224 |
| 85, 85, 255 | 0, 0, 255 | 88, 51, 255 | 85, 85, 255 | 92, 92, 255 | 173, 216, 230 |
| 255, 85, 255 | 255, 0, 255 | 249, 53, 248 | 255, 85, 255 | 255, 0, 255 | |
| 85, 255, 255 | 0, 255, 255 | 20, 240, 240 | 85, 255, 255 | 0, 255, 255 | 224, 255, 255 |
| | | | | | 255, 255, 255 |



Exercise#1 image construction



an image is a
matrix of
pixels



Applications of image processing

- **Object classification:** การแยกประเภทวัตถุจากภาพ



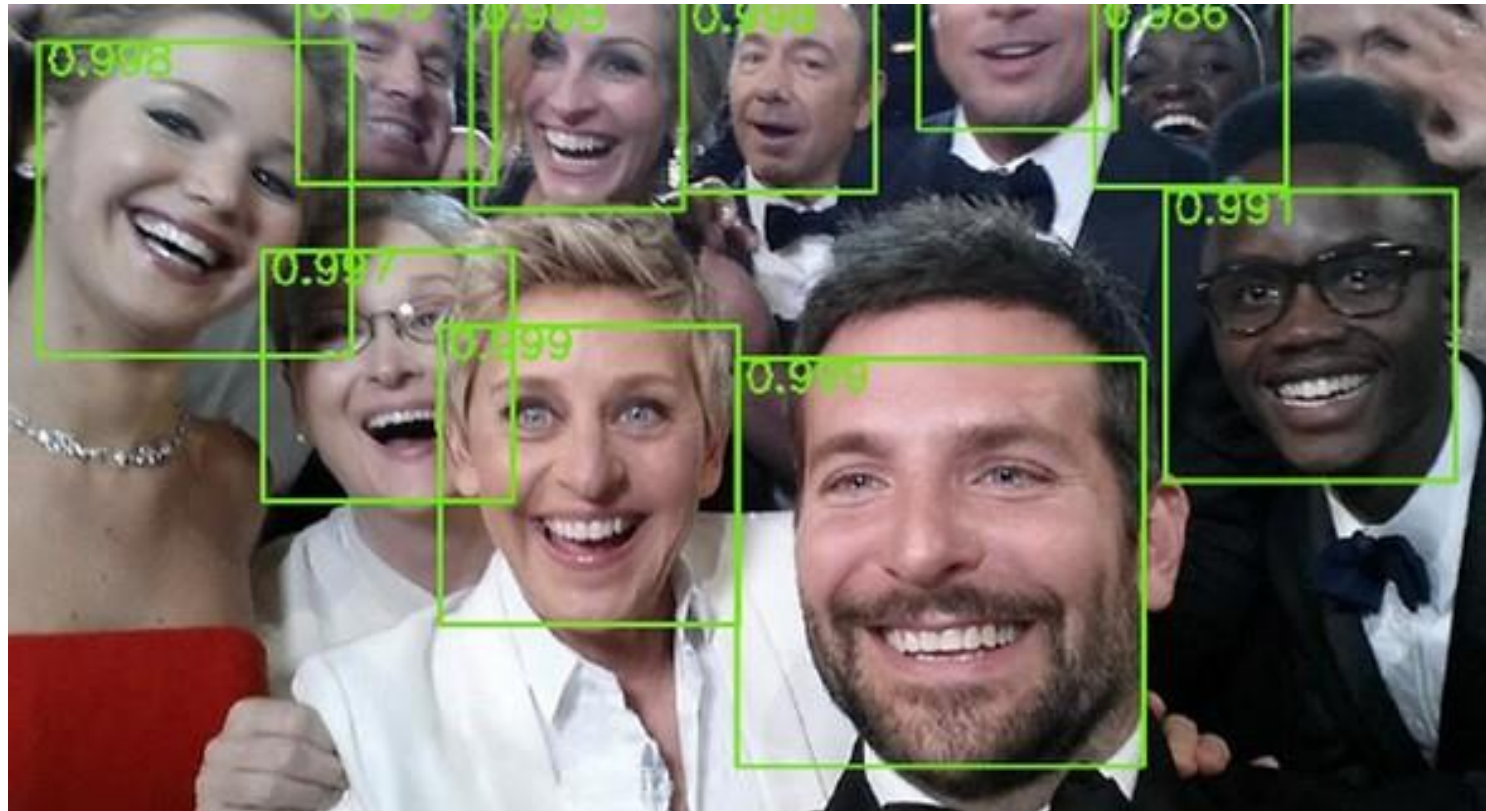
Applications of image processing

- Object detection: การตรวจจับวัตถุเป้าหมายในภาพ

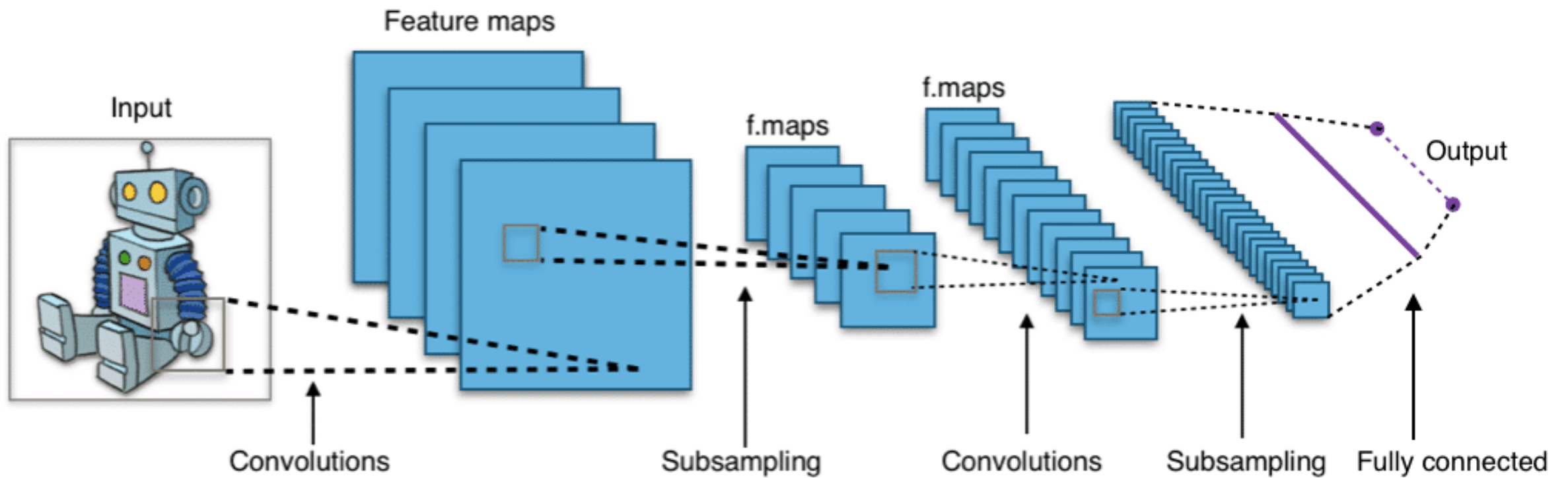


Face detection

- Object detection: การตรวจจับวัตถุเป้าหมายในภาพ --> ใบหน้า



<https://www.technologyreview.com/2015/02/16/169357/the-face-detection-algorithm-set-to-revolutionize-image-search/>



<https://towardsdatascience.com/hands-on-machine-learning-example-real-time-object-detection-with-yolo-v2-ebdd8441c12a>



Face detection library

- OpenCV Haar cascades (2001)
 - Developed in 2001
 - Based on edge detection features
- MTCNN
 - Developed in 2016
 - Based on deep learning model (Convolutional Neural Network)

FaceDe x | will sm x | object x | Diagn x | LNCS x | empty x | 2564 x | +

colab.research.google.com/drive/18XW-K2TVvW9D80S7dwuC2mzDEyZM1IBJ?hl=th#scrollTo=cdeQ3D1...

FaceDetection.ipynb ☆

ไฟล์ แก้ไข มุมมอง แทรก รันใหม่ เครื่องมือ ความช่วย

แสดงความคิดเห็น แชร์

RAM ดิสก์

ไฟล์

sample_data

test.jpg

Read images from files

```
from matplotlib import pyplot

pixels = pyplot.imread('test.jpg')
pyplot.imshow(pixels)
pyplot.show()
```

[] pixels

Introduction to AI In Image Processing

ดิสก์ ใช้ได้อีก 61.54 GB

ไฟล์

sample_data

test.jpg

ดิสก์ 61.54 GB

```
+ โค้ด + ข้อความ
```

```
implementation can be found at: https://pypi.org/project/mtcnn/.
```

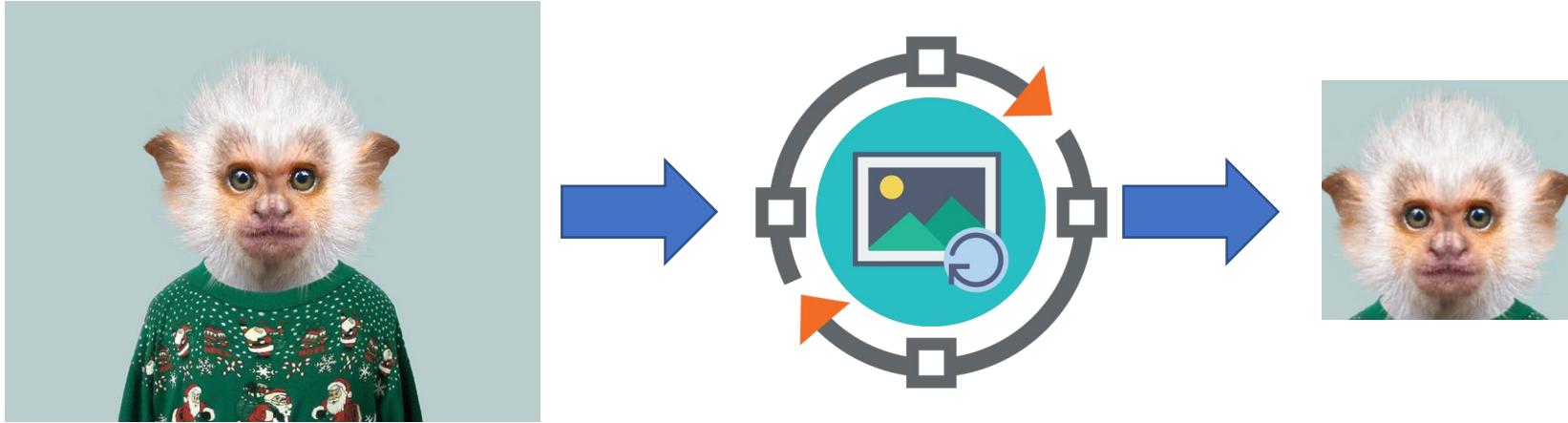
```
!pip install opencv-python
!pip install MTCNN
```

```
Requirement already satisfied: opencv-python in /usr/local/lib/python3.7/dist-packages (4.1.2.
Requirement already satisfied: numpy>=1.14.5 in /usr/local/lib/python3.7/dist-packages (from o
Collecting MTCNN
  Downloading mtcnn-0.1.1-py3-none-any.whl (2.3 MB)
    |████████████████████████████████████████| 2.3 MB 3.7 MB/s
Requirement already satisfied: opencv-python>=4.1.0 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: keras>=2.0.0 in /usr/local/lib/python3.7/dist-packages (from MT
Requirement already satisfied: numpy>=1.14.5 in /usr/local/lib/python3.7/dist-packages (from o
Installing collected packages: MTCNN
Successfully installed MTCNN-0.1.1
```

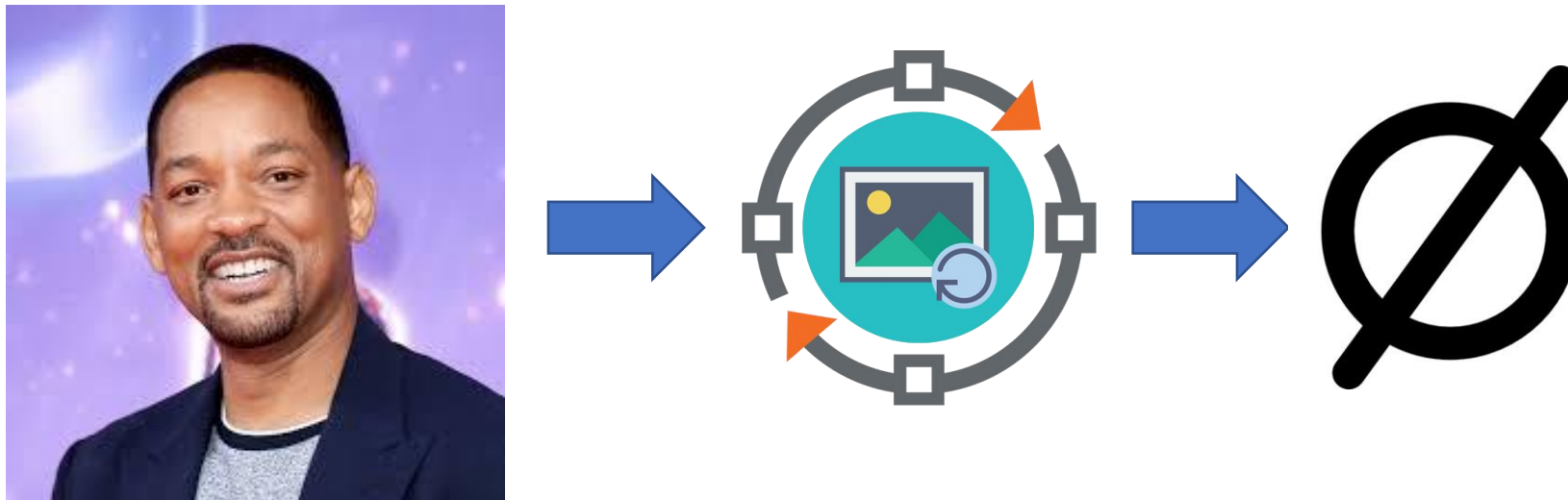
```
[ ] from matplotlib import pyplot
import cv2
```

ความผิดพลาดในการตรวจจับใบหน้า สามารถแบ่งได้เป็น 2 ชนิด คือ

- False detection --> detect non face object as faces



- False rejection - > fail to detect faces from images with faces



Exercise#2 Face detection performance

- https://github.com/benapa/python_face_detection