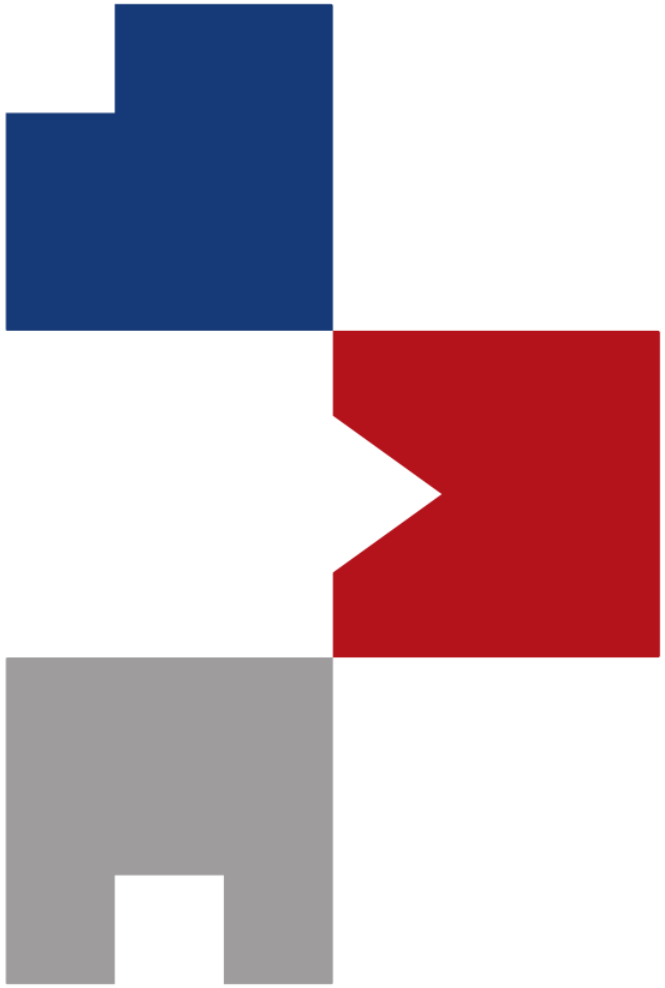
Note) Slides and example codes are available:
https://github.com/mint-lab/dl_tutorial



DL Lab #1:
Object Detection using YOLO

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Overview

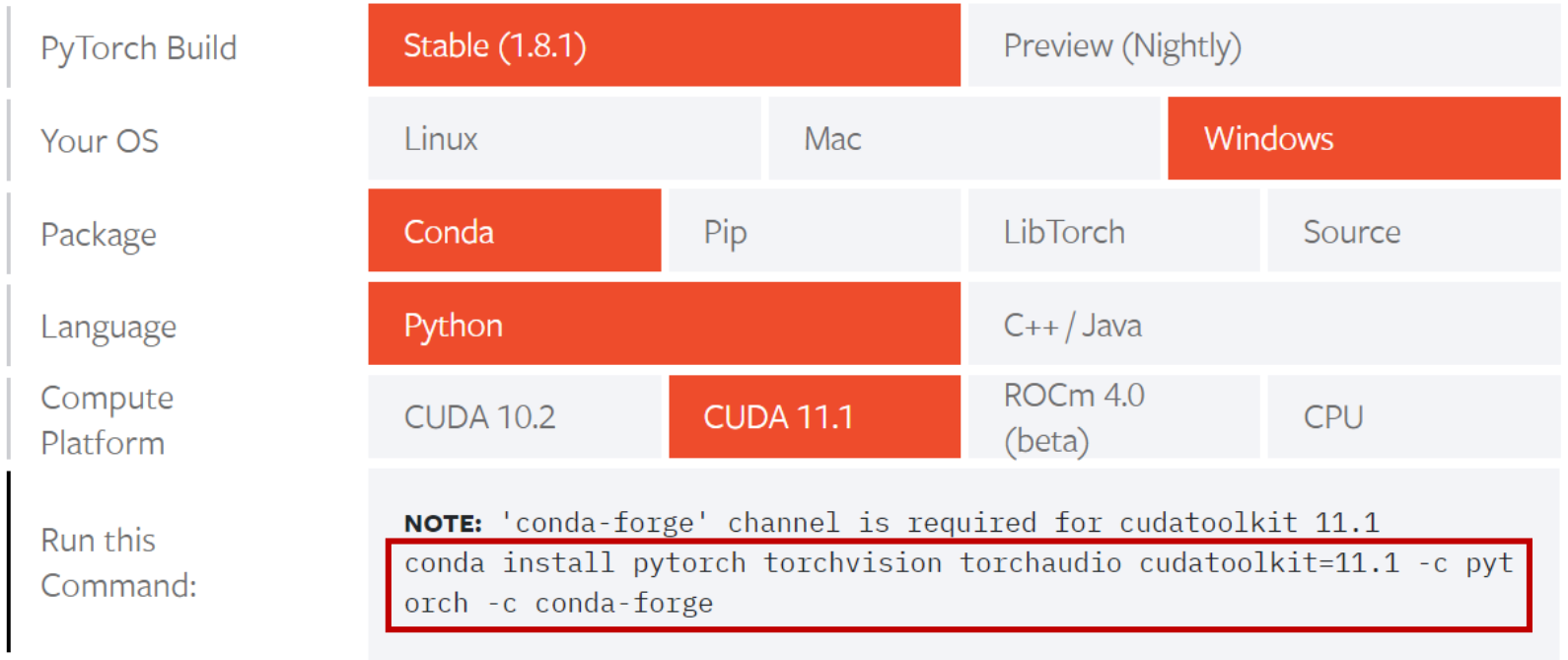
- **Prerequisite**
  - Anaconda (Individual Edition) with PyTorch Installation
  - Google Colab

- **Practice) Object Detection using YOLO**
  - The given data
  - Expected results
  - Practice with the skeleton code
    - Step #1) Run the given the skeleton code

- **Assignment**
  - Mission: Run the given skeleton code

Review) PyTorch Installation

- Please follow PyTorch's installation instruction for your system.
  - Note) If you want GPU acceleration, please install the matched version of CUDA in advance. Please visit CUDA Toolkit Archive to download a specific version of CUDA.

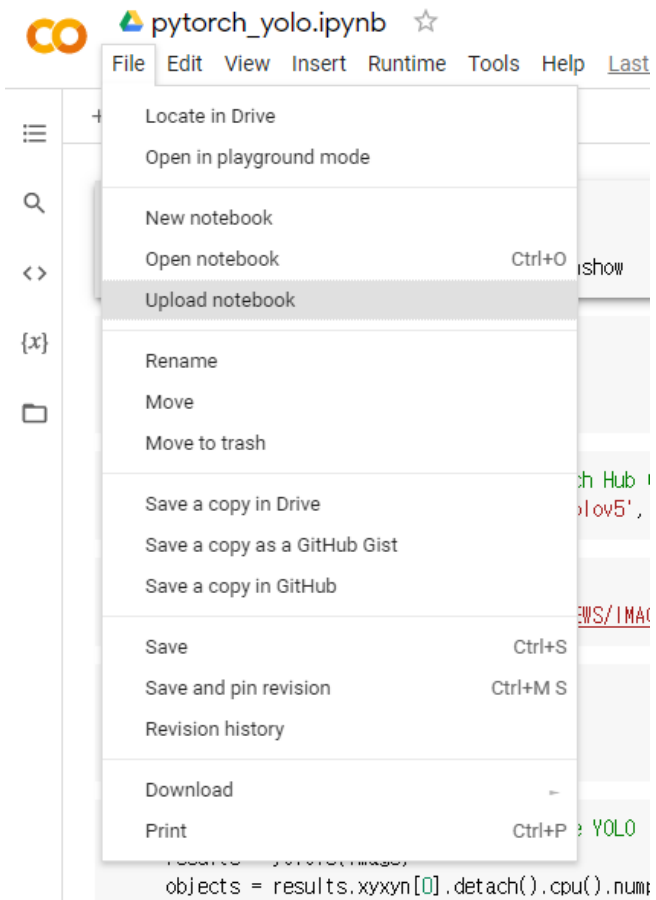


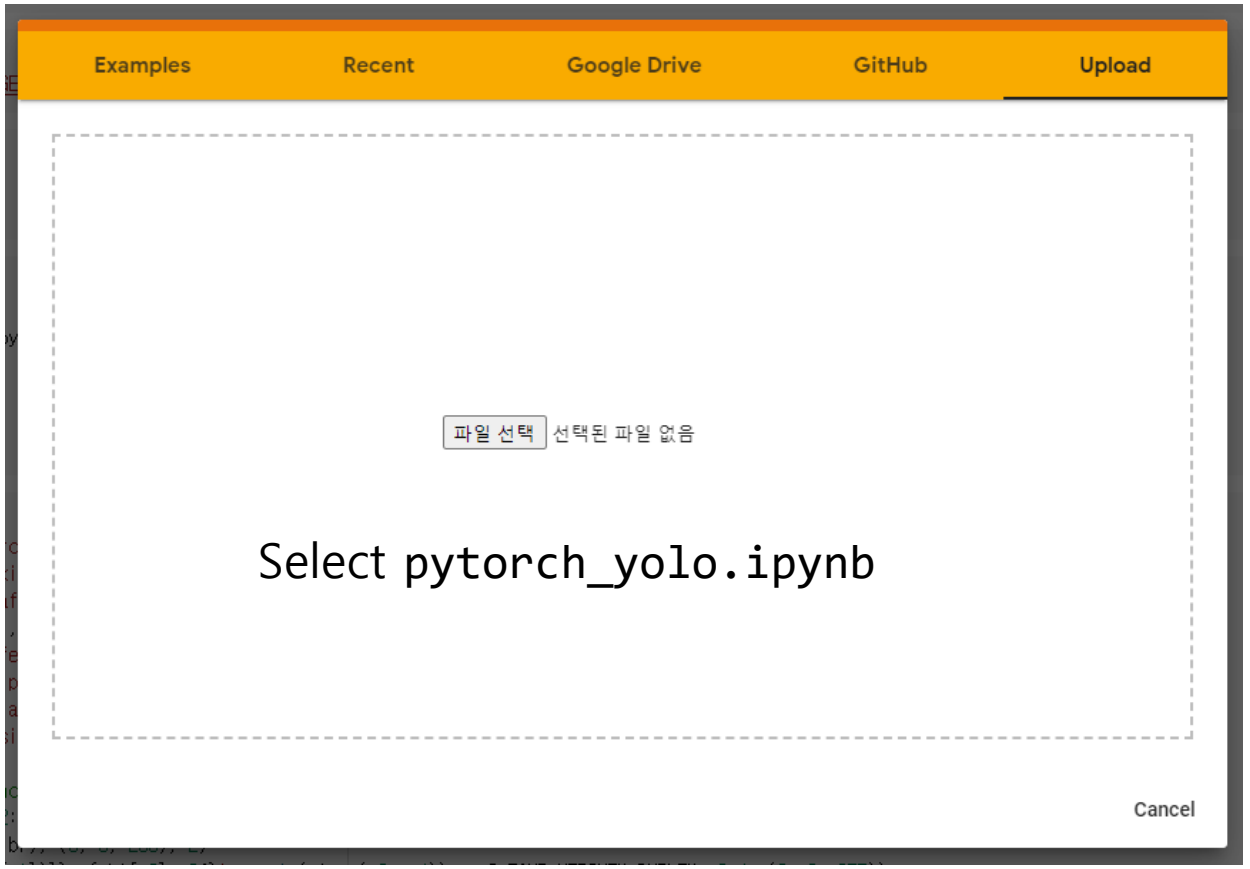
- Note) You can use Google Colab without local installation of PyTorch.

Image: PyTorch (retrieved on April 7th, 2021)

Google Colab

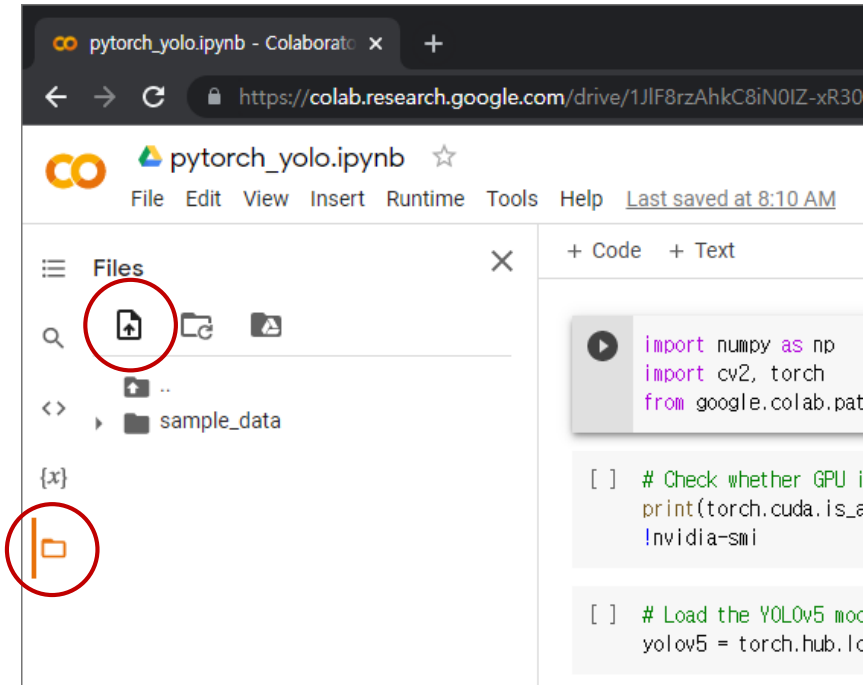
- Google Colaboratory
  - It requires a Google account.
- Please upload the given notebook file, `pytorch_yolo.ipynb`.





Practice) Object Detection using YOLO

- The given data (`test.jpg`)
  - Method #1) Upload the given data

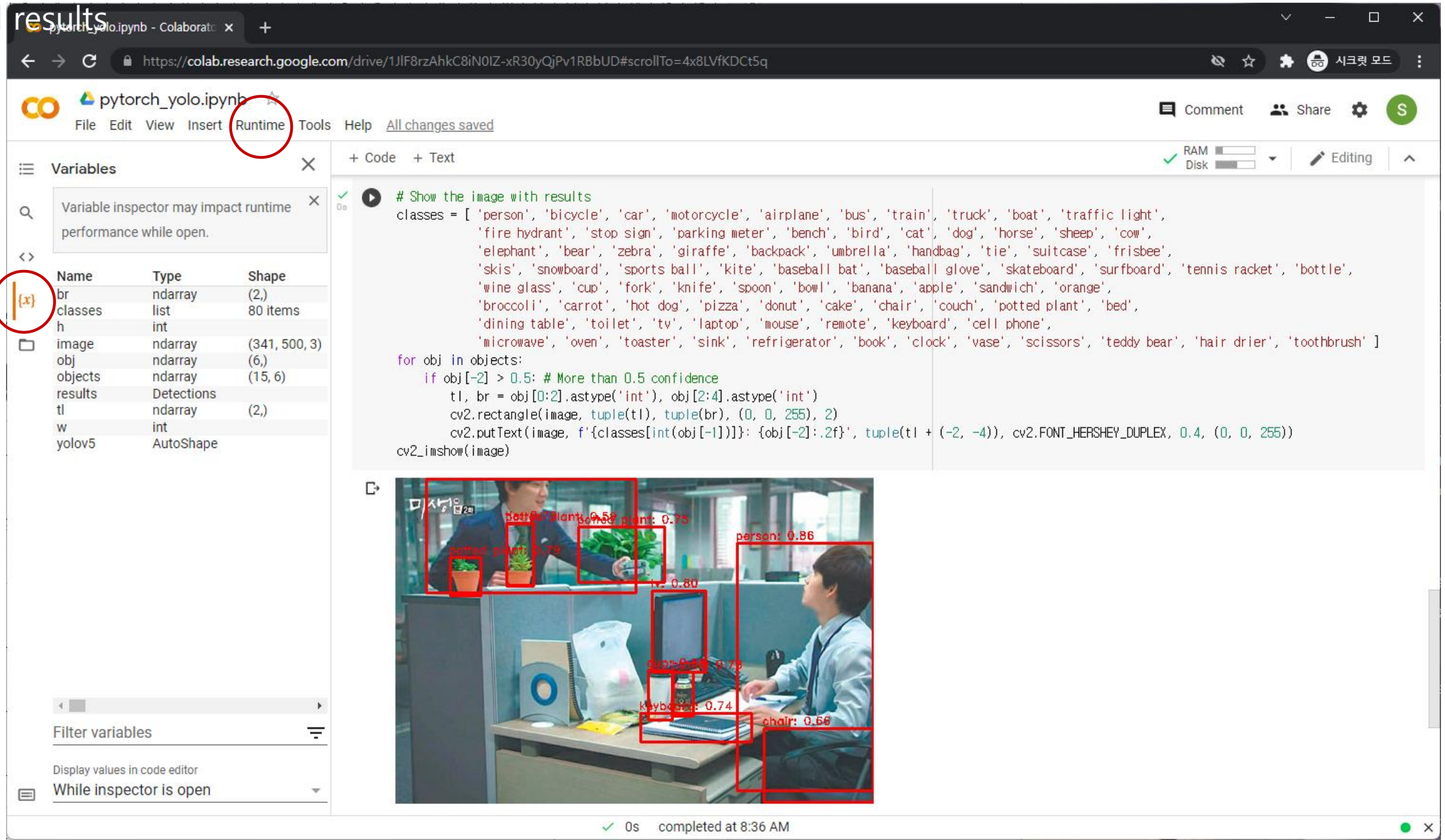


  - Method #2) Download the image from internet

```
# Download an image from internet
!wget -c 'https://dimg.donga.com/wps/NEWS/IMAGE/2014/11/26/68179447.1.jpg' -O 'test.jpg'
```

Practice) Object Detection using YOLO

- Expected results

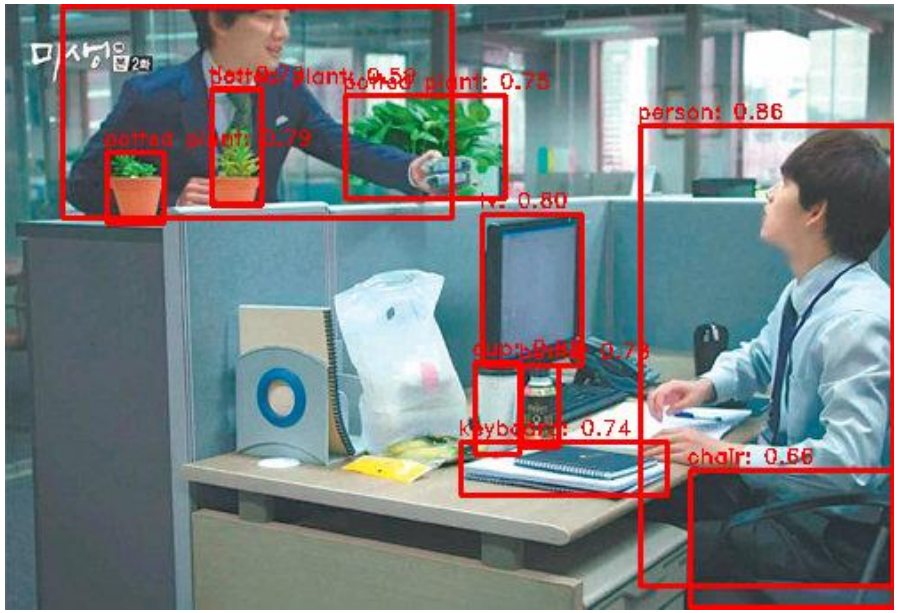


Practice) Object Detection using YOLO

- The given skeleton code (1/2)

```
import numpy as np
import cv2, torch
from google.colab.patches import cv2_imshow

# Check whether GPU is available or not
print(torch.cuda.is_available())
!nvidia-smi

# Load the YOLOv5 model from the Pytorch Hub (https://pytorch.org/hub/)
yolov5 = torch.hub.load('ultralytics/yolov5', 'yolov5l', pretrained=True)

# Download an image from internet
!wget -c 'https://dimg.donga.com/wps/NEWS/IMAGE/2014/11/26/68179447.1.jpg' -O 'test.jpg'

# Load an image on internet
image = cv2.imread('test.jpg')
cv2_imshow(image)
```

Practice) Object Detection using YOLO

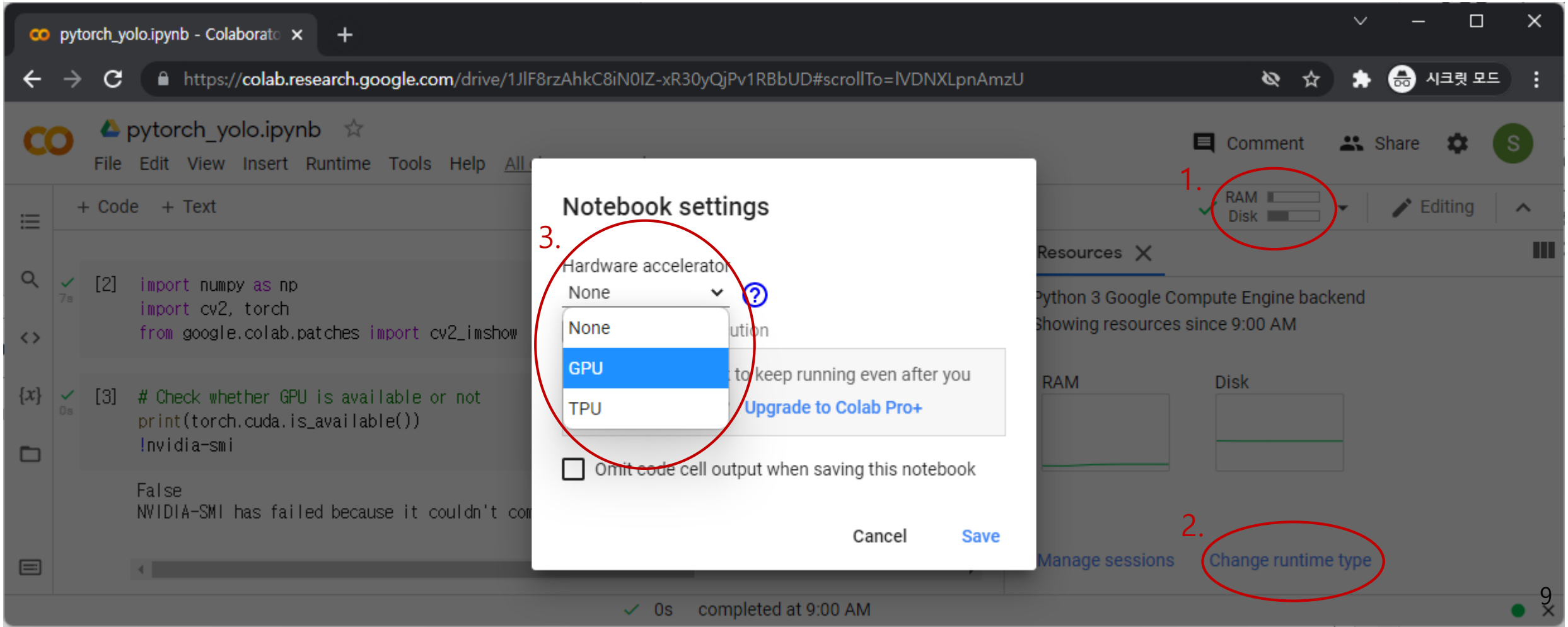


- The given skeleton code (2/2)

```
# Detect objects on the image using the YOLO
results = yolov5(image)
objects = results.xyxyn[0].detach().cpu().numpy()

# Rescale object locations
h, w, _ = image.shape
objects[:,0:4] = objects[:,0:4] * [w, h, w, h]

# Show the image with results
classes = [ 'person', 'bicycle', 'car', 'motorcycle', 'airplane', 'bus', 'train', 'truck', ... ]
for obj in objects:
    if obj[-2] > 0.5: # More than 0.5 confidence
        tl, br = obj[0:2].astype('int'), obj[2:4].astype('int')
        cv2.rectangle(image, tuple(tl), tuple(br), (0, 0, 255), 2)
        cv2.putText(image, f'{classes[int(obj[-1])]}: {obj[-2]:.2f}', tuple(tl + (-2, -
4)), cv2.FONT_HERSHEY_DUPLEX, 0.4, (0, 0, 255))
cv2_imshow(image)
```

Tip) If Your Session does not have a GPU

1. Click "RAM / Disk" (or list box(▼) > View resources)
2. Click "Change runtime type"
3. Select "Hardware accelerator" as "GPU"



Assignment

- Mission
  - Run the skeleton code with your desired image (or video)
  - Submit your screenshot (`screenshot.png`) of your results (on your web browser or Anaconda)

- Condition
  - You can start from scratch (without using the given skeleton code).
    - However, you should use another image or video.
  - You can freely change the given skeleton code if necessary.

- Submission
  - Deadline: **November 20, 2025 23:59** (firm deadline; no extension)
  - Where: e-Class > Assignments
  - Score: Max 10 points