HƯỚNG DẪN THỰC HÀNH

YOLO VÀ DARKNET

(*Keyword: Yolo, Darknet)*

I. Mục tiêu

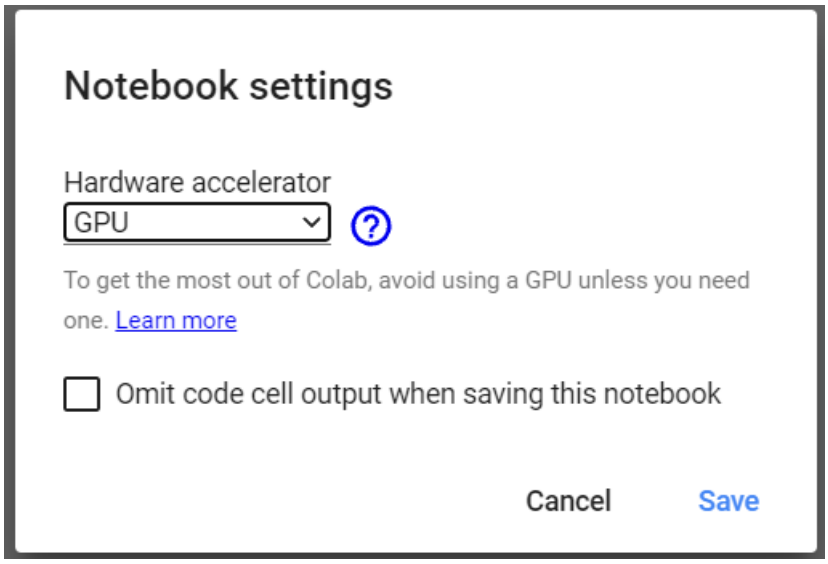
- Sinh viên có thể sử dụng YOLO v4 trên Google Colab để huấn luyện theo bộ dữ liệu tùy chọn và thử nghiệm kết quả huấn luyện.

II. Yêu cầu cài đặt

- Sử dụng Google Colab với ngôn ngữ lập trình: Python, phiên bản khuyến nghị mặc định hiện tại là 3.6

III. Nội dung

1. Kiểm tra môi trường Google Colab
   - vào menu Runtime → Change runtime type để chuyển sang chế độ GPU.



- kiểm tra thử xem runtime đã có GPU chưa, thông tin GPU...

```
import torch

print(torch.cuda.current_device())
print(torch.cuda.device(0))
print(torch.cuda.device_count())
print(torch.cuda.get_device_name(0))
print(torch.cuda.is_available())

# setting device on GPU if available, else CPU
device = torch.device('cuda' if torch.cuda.is_available() else '
cpu')
print('Using device:', device)
print()

# additional info when using cuda
if device.type == 'cuda':
    print(torch.cuda.get_device_name(0))
    print('Memory Usage:')
    print('Allocated:', round(torch.cuda.memory_allocated(0)/102
4**3,1), 'GB')
    print('Cached:   ', round(torch.cuda.memory_cached(0)/1024**
3,1), 'GB')
```

```
0
<torch.cuda.device object at 0x7f09de124290>
1
Tesla K80
True
Using device: cuda

Tesla K80
Memory Usage:
Allocated: 0.0 GB
Cached:    0.0 GB
```

2. Cấp quyền truy cập vào Google Drive để truy xuất, lưu trữ mã nguồn, dữ liệu

```
from google.colab import drive
drive.mount('/content/gdrive')
```

```
Go to this URL in a browser: https://accounts.google.com/o/oauth2/auth?client_id=

Enter your authorization code:
```

3. Tải mã nguồn YOLOv4-PyTorch

```
%cd /content/gdrive/My\ Drive/colab
!rm -rf yolov4
%mkdir yolov4
%cd /content/gdrive/My\ Drive/colab/yolov4
!rm -rf pytorch-YOLOv4
!git clone https://github.com/Tianxiaomo/pytorch-YOLOv4
```

```
/content/gdrive/My Drive/colab
/content/gdrive/My Drive/colab/yolov4
Cloning into 'pytorch-YOLOv4'...
remote: Enumerating objects: 917, done.
remote: Counting objects: 100% (3/3), done.
remote: Compressing objects: 100% (3/3), done.
remote: Total 917 (delta 0), reused 0 (delta 0), pack-reused 914
Receiving objects: 100% (917/917), 2.34 MiB | 9.56 MiB/s, done.
Resolving deltas: 100% (557/557), done.
/content/gdrive/My Drive/colab/pytorch-YOLOv4
```

4. Cài đặt môi trường cho YOLOv4-PyTorch

```
!pip install -r requirements.txt
```

```
Requirement already satisfied: scikit_image==0.16.2 in /usr/local/lib/python3.7/dist-packages (from -r requirements.txt (line 3)) (0.16.2)
Collecting matplotlib==2.2.3
  Downloading matplotlib-2.2.3-cp37-cp37m-manylinux1_x86_64.whl (12.6 MB)
     |████████████████████████████████| 12.6 MB 156 kB/s
Collecting tqdm==4.43.0
  Downloading tqdm-4.43.0-py2.py3-none-any.whl (59 kB)
     |████████████████████████████████| 59 kB 4.7 MB/s
Requirement already satisfied: easydict==1.9 in /usr/local/lib/python3.7/dist-packages (from -r requirements.txt (line 6)) (1.9)
Requirement already satisfied: Pillow==7.1.2 in /usr/local/lib/python3.7/dist-packages (from -r requirements.txt (line 7)) (7.1.2)
Collecting tensorboardX
  Downloading tensorboardX-2.4-py2.py3-none-any.whl (124 kB)
     |████████████████████████████████| 124 kB 49.1 MB/s
Requirement already satisfied: scipy>=0.19.0 in /usr/local/lib/python3.7/dist-packages (from scikit_image==0.16.2->-r requirements.txt (line 3)) (1.4.1)
Requirement already satisfied: PyWavelets>=0.4.0 in /usr/local/lib/python3.7/dist-packages (from scikit_image==0.16.2->-r requirements.txt (line 3)) (1.1.1)
Requirement already satisfied: networkx>=2.0 in /usr/local/lib/python3.7/dist-packages (from scikit_image==0.16.2->-r requirements.txt (line 3)) (2.6.3)
Requirement already satisfied: imageio>=2.3.0 in /usr/local/lib/python3.7/dist-packages (from scikit_image==0.16.2->-r requirements.txt (line 3)) (2.4.1)
Requirement already satisfied: python-dateutil>=2.1 in /usr/local/lib/python3.7/dist-packages (from matplotlib==2.2.3->-r requirements.txt (line 4)) (2.8.2)
Requirement already satisfied: pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.0.1 in /usr/local/lib/python3.7/dist-packages (from matplotlib==2.2.3->-r requirements.txt (line 4)) (2.4.7)
Requirement already satisfied: pytz in /usr/local/lib/python3.7/dist-packages (from matplotlib==2.2.3->-r requirements.txt (line 4)) (2018.9)
Requirement already satisfied: six>=1.10 in /usr/local/lib/python3.7/dist-packages (from matplotlib==2.2.3->-r requirements.txt (line 4)) (1.15.0)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.7/dist-packages (from matplotlib==2.2.3->-r requirements.txt (line 4)) (0.10.0)
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.7/dist-packages (from matplotlib==2.2.3->-r requirements.txt (line 4)) (1.3.2)
Requirement already satisfied: protobuf>=3.8.0 in /usr/local/lib/python3.7/dist-packages (from tensorboardX->-r requirements.txt (line 8)) (3.17.3)
Installing collected packages: numpy, matplotlib, tqdm, torch, tensorboardX
  Attempting uninstall: numpy
    Found existing installation: numpy 1.19.5
    Uninstalling numpy-1.19.5:
      Successfully uninstalled numpy-1.19.5
  Attempting uninstall: matplotlib
    Found existing installation: matplotlib 3.2.2
    Uninstalling matplotlib-3.2.2:
      Successfully uninstalled matplotlib-3.2.2
  Attempting uninstall: tqdm
    Found existing installation: tqdm 4.62.3
    Uninstalling tqdm-4.62.3:
      Successfully uninstalled tqdm-4.62.3
  Attempting uninstall: torch
    Found existing installation: torch 1.9.0+cu102
    Uninstalling torch-1.9.0+cu102:
      Successfully uninstalled torch-1.9.0+cu102
ERROR: pip's dependency resolver does not currently take into account all the packages that are installed. This behaviour is the source of the following dependency conflicts.
torchvision 0.10.0+cu102 requires torch==1.9.0, but you have torch 1.4.0 which is incompatible.
torchtext 0.10.0 requires torch==1.9.0, but you have torch 1.4.0 which is incompatible.
tensorflow 2.6.0 requires numpy~=1.19.2, but you have numpy 1.18.2 which is incompatible.
plotnine 0.6.0 requires matplotlib>=3.1.1, but you have matplotlib 2.2.3 which is incompatible.
panel 0.12.1 requires tqdm>=4.48.0, but you have tqdm 4.43.0 which is incompatible.
mizani 0.6.0 requires matplotlib>=3.1.1, but you have matplotlib 2.2.3 which is incompatible.
kapre 0.3.5 requires numpy>=1.18.5, but you have numpy 1.18.2 which is incompatible.
datascience 0.10.6 requires folium==0.2.1, but you have folium 0.8.3 which is incompatible.
arviz 0.11.2 requires matplotlib>=3.0, but you have matplotlib 2.2.3 which is incompatible.
albumentations 0.1.12 requires imgaug<0.2.7,>=0.2.5, but you have imgaug 0.2.9 which is incompatible.
Successfully installed matplotlib-2.2.3 numpy-1.18.2 tensorboardX-2.4 torch-1.4.0 tqdm-4.43.0
WARNING: The following packages were previously imported in this runtime:
  [matplotlib,mpl_toolkits,numpy]
You must restart the runtime in order to use newly installed versions.
RESTART RUNTIME
```

Chú ý bấm nút **RESTART RUNTIME** sau khi cài đặt xong.

5. Chuẩn bị dữ liệu

   - cần chuẩn bị dữ liệu phù hợp theo chuẩn Yolo Dataset và đưa vào thư mục tương ứng trong mã nguồn

```
%cd /content/gdrive/My\ Drive/colab/pytorch-YOLOv4

!rm -rf train
%mkdir train
%cp /content/gdrive/My\ Drive/colab/pytorch-
YOLOv4/data_unzip/train/_annotations.txt train/train.txt
%cp /content/gdrive/My\ Drive/colab/pytorch-
YOLOv4/data_unzip/train/_classes.txt train/_classes.txt
%cp /content/gdrive/My\ Drive/colab/pytorch-
YOLOv4/data_unzip/train/_annotations.txt train.txt
%cp /content/gdrive/My\ Drive/colab/pytorch-
YOLOv4/data_unzip/train/*.jpg train/
%cp /content/gdrive/My\ Drive/colab/pytorch-
YOLOv4/data_unzip/valid/*.jpg train/

!rm -rf data
%mkdir data
%cp /content/gdrive/My\ Drive/colab/pytorch-
YOLOv4/data_unzip/valid/_annotations.txt data/val.txt

!rm -rf test
%mkdir test
%cp /content/gdrive/My\ Drive/colab/pytorch-
YOLOv4/data_unzip/test/_classes.txt test/_classes.txt
%cp /content/gdrive/My\ Drive/colab/pytorch-
YOLOv4/data_unzip/test/*.jpg test/
```

```
%cd /content/gdrive/My\ Drive/colab/pytorch-YOLOv4

!rm -rf train
%mkdir train
%cp /content/gdrive/My\ Drive/colab/data/ChessPieces.v1-416x416auto-orient.yolov4pytorch/train/_annotations.txt train/train.txt
%cp /content/gdrive/My\ Drive/colab/data/ChessPieces.v1-416x416auto-orient.yolov4pytorch/train/_classes.txt train/_classes.txt
%cp /content/gdrive/My\ Drive/colab/data/ChessPieces.v1-416x416auto-orient.yolov4pytorch/train/_annotations.txt train.txt
%cp /content/gdrive/My\ Drive/colab/data/ChessPieces.v1-416x416auto-orient.yolov4pytorch/train/*.jpg train/
%cp /content/gdrive/My\ Drive/colab/data/ChessPieces.v1-416x416auto-orient.yolov4pytorch/valid/*.jpg train/

!rm -rf data
%mkdir data
%cp /content/gdrive/My\ Drive/colab/data/ChessPieces.v1-416x416auto-orient.yolov4pytorch/valid/_annotations.txt data/val.txt

!rm -rf test
%mkdir test
%cp /content/gdrive/My\ Drive/colab/data/ChessPieces.v1-416x416auto-orient.yolov4pytorch/test/_classes.txt test/_classes.txt
%cp /content/gdrive/My\ Drive/colab/data/ChessPieces.v1-416x416auto-orient.yolov4pytorch/test/*.jpg test/
```

Ví dụ như:

- tập tin _annotation.txt hay train.txt và val.txt chứa dữ liệu đánh nhãn tọa độ và số thứ tự lớp (class) của đối tượng có trong từng tập tin ảnh tương ứng.

_classes.txt _annotations.txt

```
889c420fb266b8d0e817306110042bda_jpg.rf.187d72f3d58f732ea576641f5c702f61.jpg 170,79,195,132,11 131
9c153a9c9798dab948d4260eb109b315_jpg.rf.04a431391f78af71e5ebaf9d51d91faf.jpg 311,115,337,169,8
36066ba85572ce99198f1a21c2c8bbff_jpg.rf.1bb4689be2417ff995fbd5e22876c353.jpg 298,38,318,93,0 207,1
614811e933a680fd6535ac8bf06bf530_jpg.rf.0b9ea19fb73269b21cf021c584b84aeb.jpg 174,153,196,210,0
699edbacbfee5e6d4d6d2189bc88990a_jpg.rf.21253a833a9f17c4391a96e64b279fd9.jpg 175,196,198,255,2
0f4512d71c096f2699d705792e88fc58_jpg.rf.0971fe35ffe3ebbcc3e2a709de978aec.jpg 306,90,340,174,1 293,
3914be0cea4aa8a6bbd1081ec3b034a7_jpg.rf.1a22ac976f9598278bbbf963909a32ef.jpg 240,76,262,130,2
254f92b18b2a81f88b85e7aed3cabc61_jpg.rf.09fc82bf7878065eb6cad223e60f7f0b.jpg 338,300,372,353,8
dd6b5c3cb2d7e77f38f1dfeb2bff0431_jpg.rf.065f8833508d101a1f1449e8fbabc314.jpg 312,90,339,156,4 314,
e79deba8fe520409790b601ad61da4ee_jpg.rf.016bc04dee292f80d1f975931f32bc21.jpg 208,88,226,128,3
49d365236ee4fb6bd982b0f00bff007e_jpg.rf.16bc32d2b40baeabec00c02b2f9d0e84.jpg 306,84,336,164,1 279,
4de23afff63bc169b4ebe547a9c9b692_jpg.rf.0cf789652d85886de3d00b05bef061eb.jpg 280,227,310,284,0 311
b0f3d66c8be13f5f6aa25b67a06bdcfa_jpg.rf.01b3f3243bf31cb2ea18a89fd58044be.jpg 339,281,370,337,5 291
f3a5df526393445c6e2d38f66c1f5c27_jpg.rf.09aeba93cdea53cc6a6db62f6056ec35.jpg 48,297,74,359,2
cae099fe41d6aa30033d71e433c33c8d_jpg.rf.124529e05c30bf412475f20b8f274f95.jpg 130,85,157,169,7 100,
d0cc2420bce5b14dfd39e55dc3737e57_jpg.rf.0f1c927870242d0e614bd6e320f9969e.jpg 74,10,97,59,2
```

- tập tin _classes.txt chứa tên các loại đối tượng trên từng dòng

_classes.txt

```
black-bishop
black-king
black-knight
black-pawn
black-queen
black-rook
white-bishop
white-king
white-knight
white-pawn
white-queen
white-rook
```

Có thể viết thêm hàm để linh hoạt tính số lượng lớp đối tượng từ nội dung tập tin _classes.txt

```
# Step 04.3 Check the number of classes

def file_len(fname):
  with open(fname) as f:
    for i, l in enumerate(f):
      pass
  return i + 1

num_classes = file_len('train/_classes.txt')
print(num_classes)
```

6. Huấn luyện mạng
   - tải tập tin bộ trọng số đã được huấn luyện (pre-trained weights) để quá trình huấn luyện hiệu quả hơn tại https://drive.google.com/uc?id=1fcbR0bWzYfIEdLJPzOsn4R5mlvR6IQyA