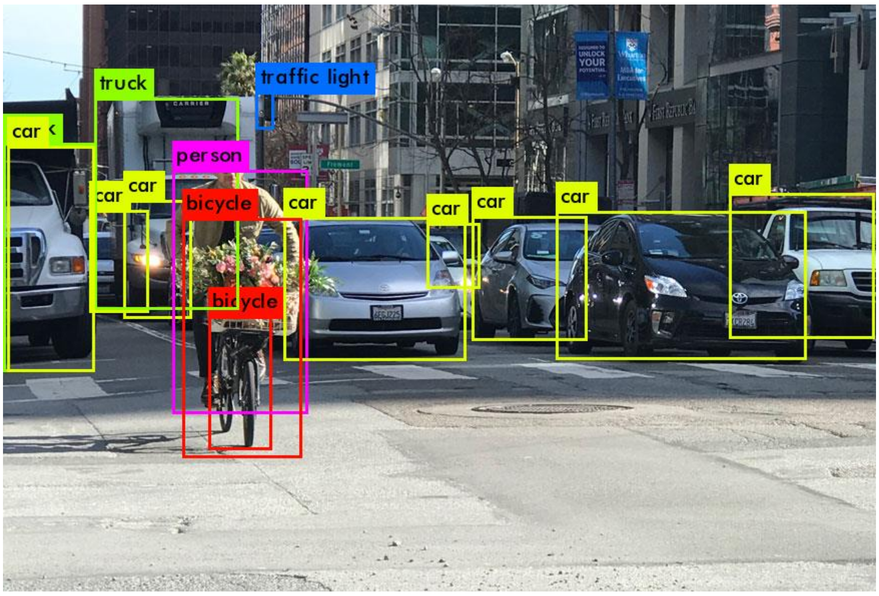
YOLOv3 DETECTOR

YOLOV3 INTRODUCTION:

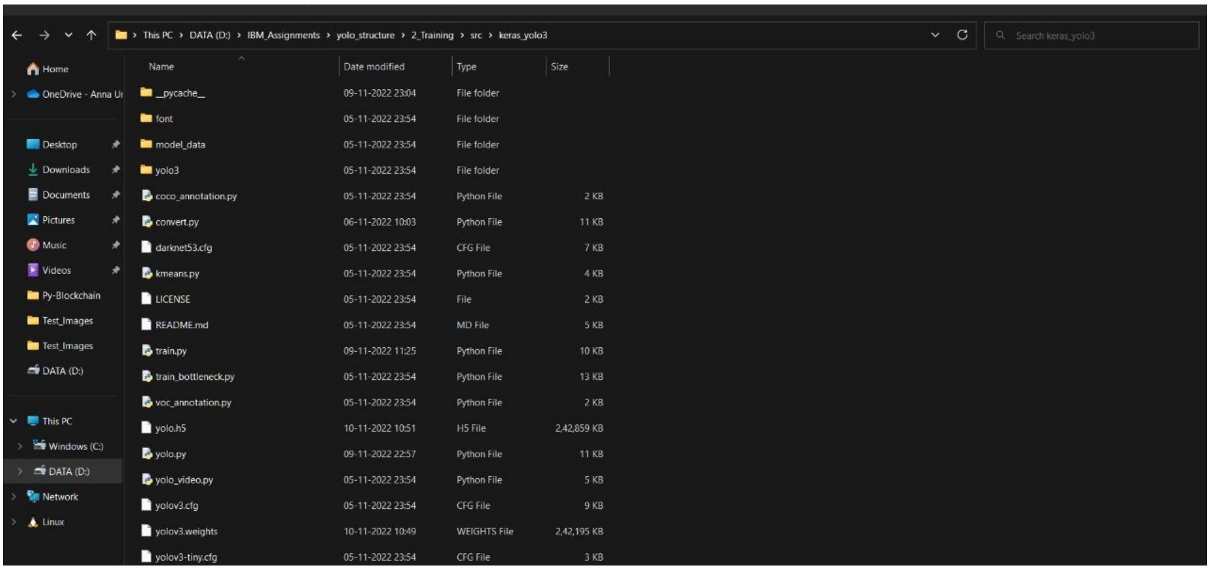
YOLOv3 (You Only Look Once, Version 3) is a real-time object detection algorithm that identifies specific objects in videos, live feeds, or images. The YOLO machine learning algorithm uses features learned by a deep convolutional neural network to detect an object. Versions 1-3 of YOLO were created by Joseph Redmon and Ali Farhadi, and the third version of the YOLO machine learning algorithm is a more accurate version of the original ML algorithm.

The first version of YOLO was created in 2016, and version 3, which is discussed extensively in this article, was made two years later in 2018. YOLOv3 is an improved version of YOLO and YOLOv2. YOLO is implemented using the Keras or OpenCV deep learning libraries.

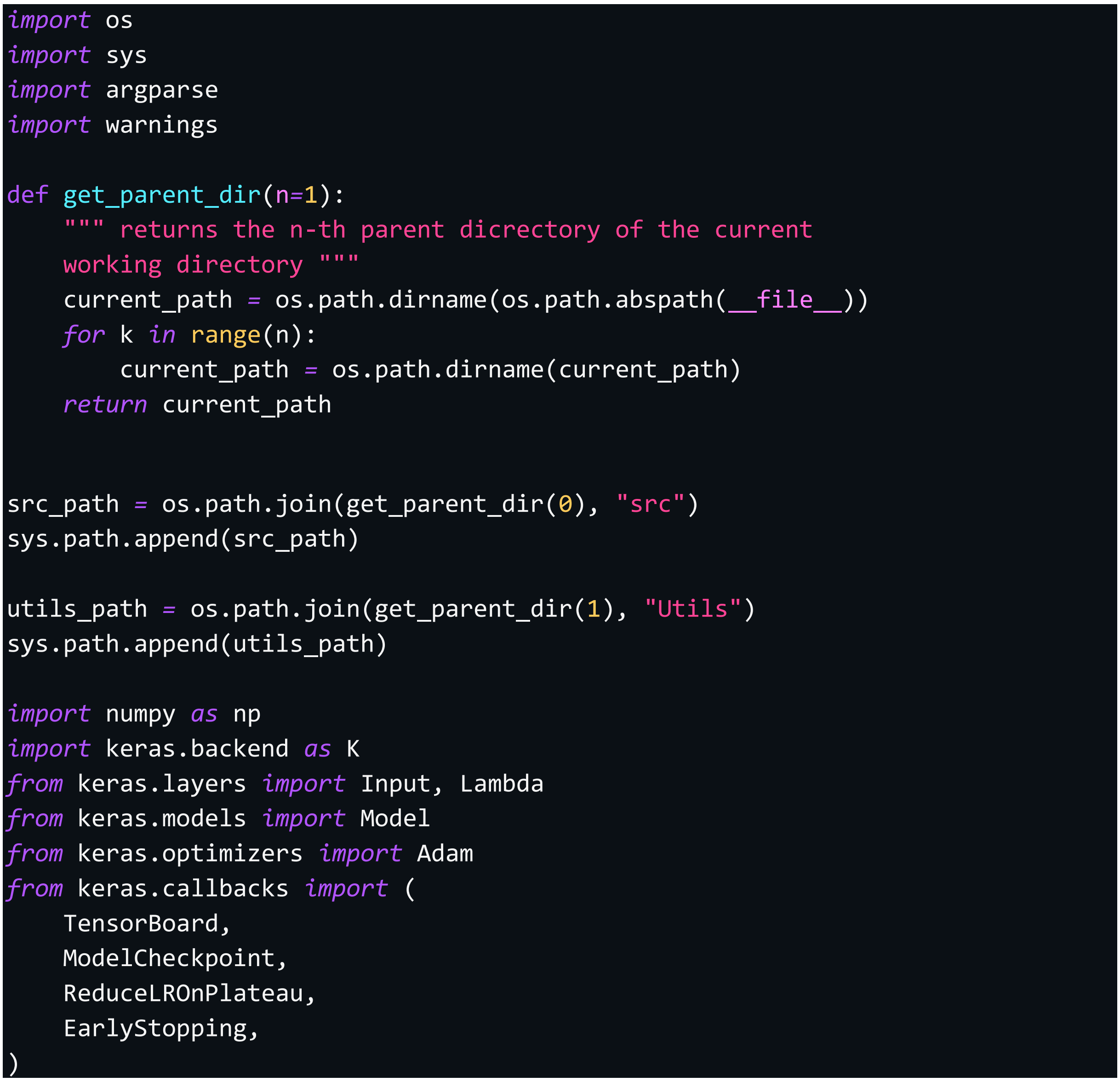


YOLOv3 Computer Vision Example

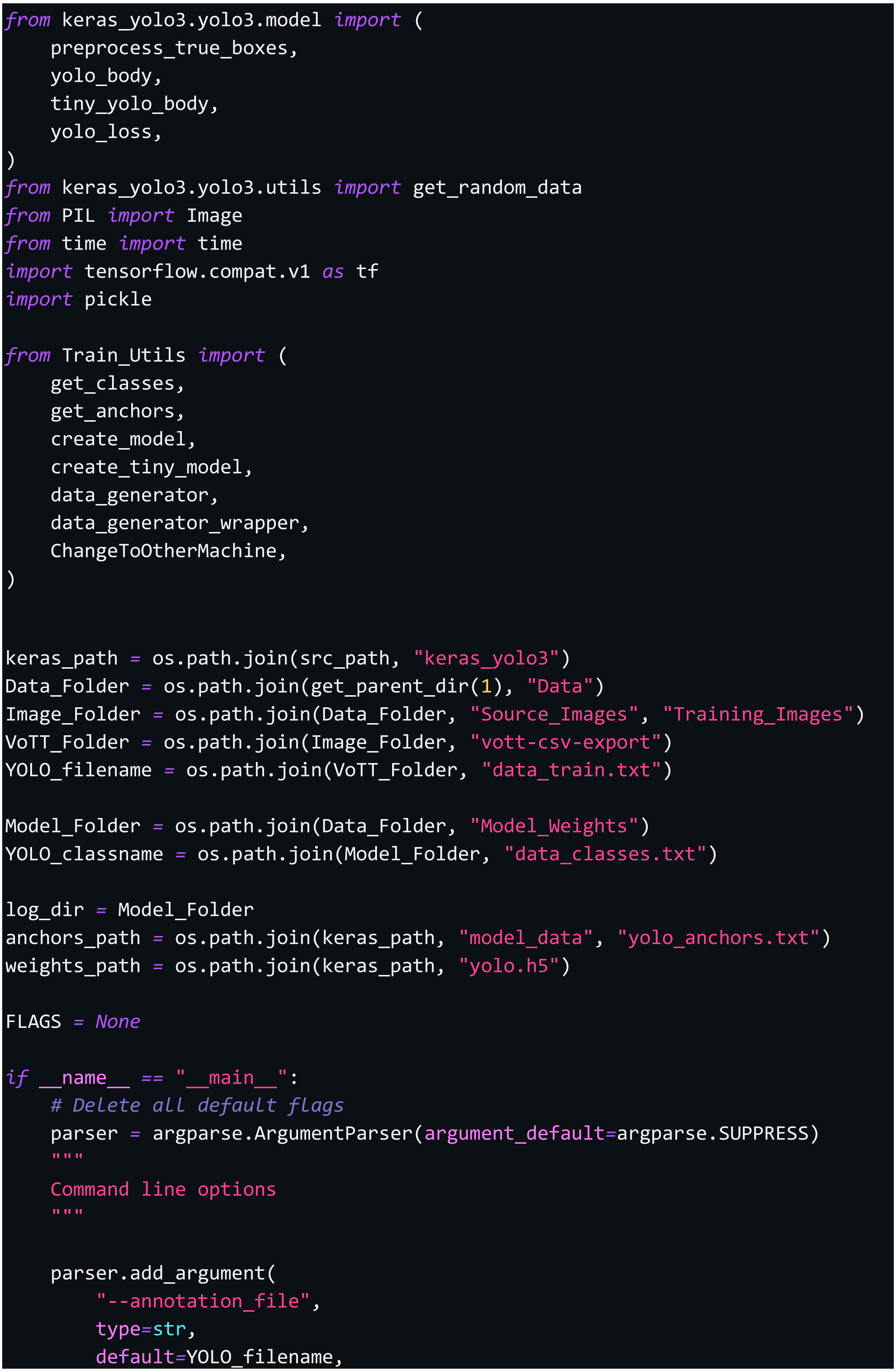
Training YOLOv for the project:



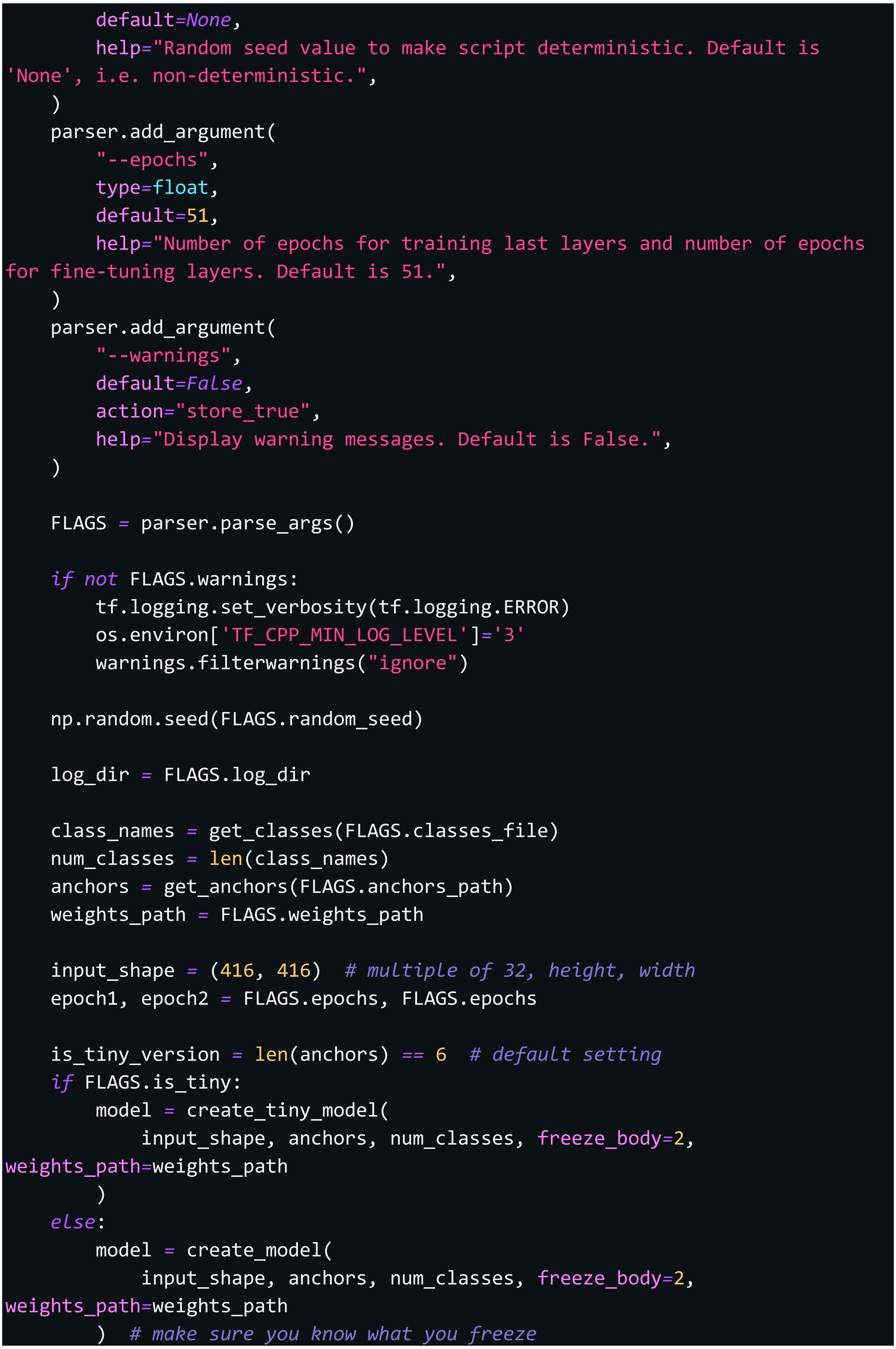
Name	Date modified	Type	Size
__pycache__	09-11-2022 23:04	File folder	
font	05-11-2022 23:54	File folder	
model_data	05-11-2022 23:54	File folder	
yolo3	05-11-2022 23:54	File folder	
coco_annotation.py	05-11-2022 23:54	Python File	2 KB
convert.py	06-11-2022 10:03	Python File	11 KB
darknet53.cfg	05-11-2022 23:54	CFG File	7 KB
kmeans.py	05-11-2022 23:54	Python File	4 KB
LICENSE	05-11-2022 23:54	File	2 KB
README.md	05-11-2022 23:54	MD File	5 KB
train.py	09-11-2022 11:25	Python File	10 KB
train_bottleneck.py	05-11-2022 23:54	Python File	13 KB
voc_annotation.py	05-11-2022 23:54	Python File	2 KB
yolo.h5	10-11-2022 10:51	H5 File	2,42,859 KB
yolo.py	09-11-2022 22:57	Python File	11 KB
yolo_video.py	05-11-2022 23:54	Python File	5 KB
yolov3.cfg	05-11-2022 23:54	CFG File	9 KB
yolov3.weights	10-11-2022 10:49	WEIGHTS File	2,42,195 KB
yolov3-tiny.cfg	05-11-2022 23:54	CFG File	3 KB



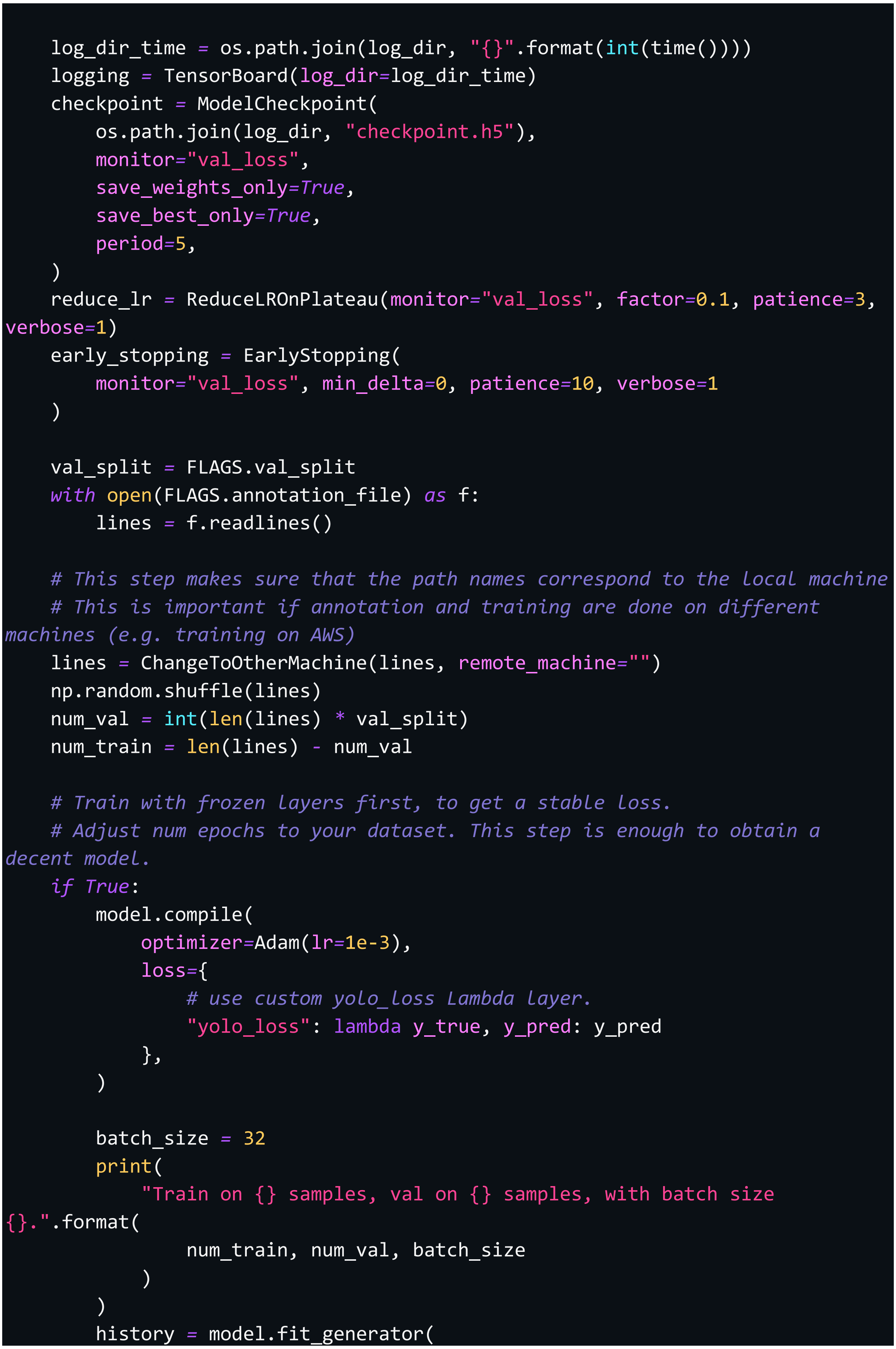
```
import os
import sys
import argparse
import warnings

def get_parent_dir(n=1):
    """ returns the n-th parent dicrectory of the current
    working directory """
    current_path = os.path.dirname(os.path.abspath(__file__))
    for k in range(n):
        current_path = os.path.dirname(current_path)
    return current_path


src_path = os.path.join(get_parent_dir(0), "src")
sys.path.append(src_path)

utils_path = os.path.join(get_parent_dir(1), "Utils")
sys.path.append(utils_path)

import numpy as np
import keras.backend as K
from keras.layers import Input, Lambda
from keras.models import Model
from keras.optimizers import Adam
from keras.callbacks import (
    TensorBoard,
    ModelCheckpoint,
    ReduceLROnPlateau,
    EarlyStopping,
)
```



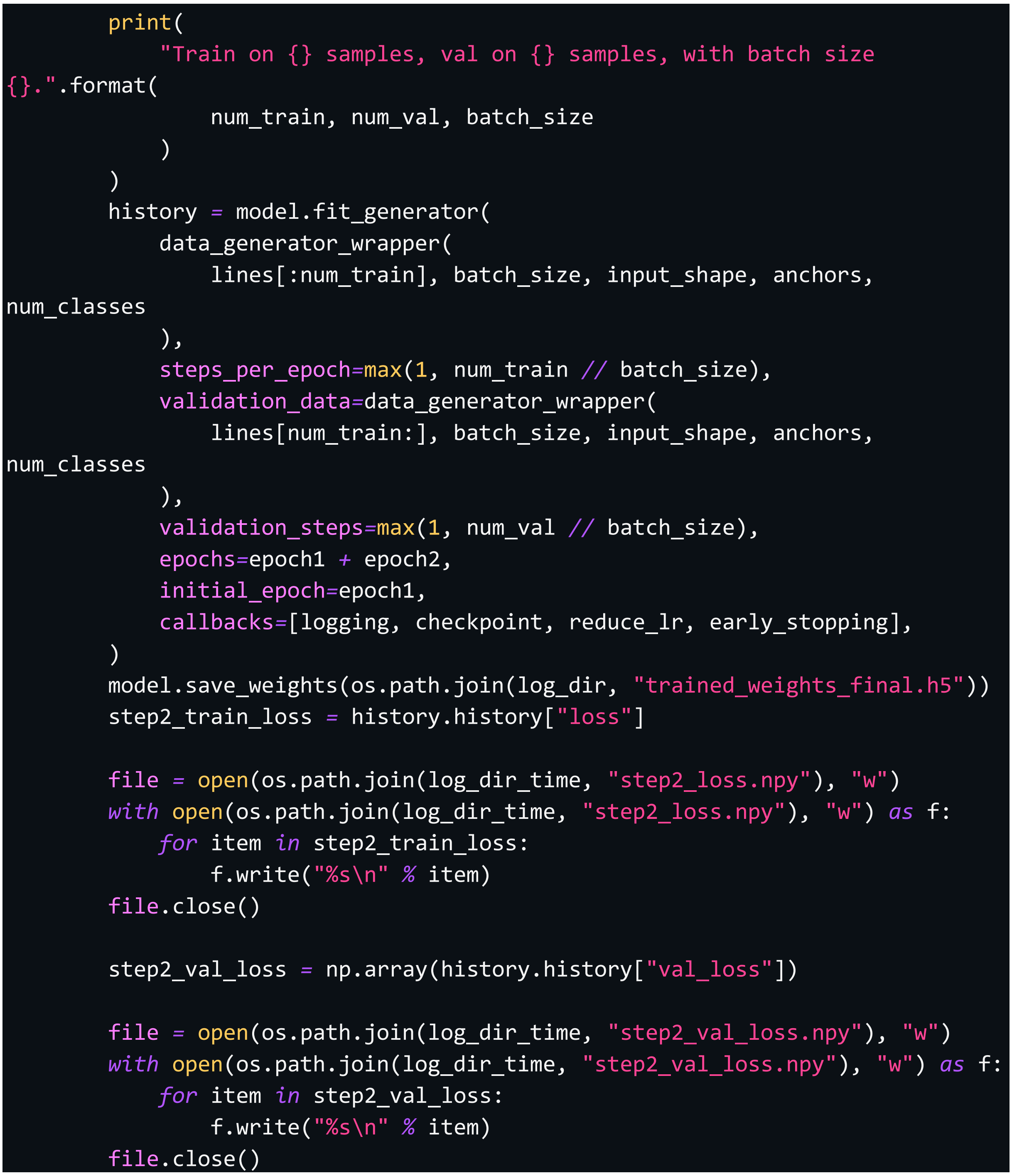
```python
from keras_yolo3.yolo3.model import (
    preprocess_true_boxes,
    yolo_body,
    tiny_yolo_body,
    yolo_loss,
)
from keras_yolo3.yolo3.utils import get_random_data
from PIL import Image
from time import time
import tensorflow.compat.v1 as tf
import pickle

from Train_Utils import (
    get_classes,
    get_anchors,
    create_model,
    create_tiny_model,
    data_generator,
    data_generator_wrapper,
    ChangeToOtherMachine,
)


keras_path = os.path.join(src_path, "keras_yolo3")
Data_Folder = os.path.join(get_parent_dir(1), "Data")
Image_Folder = os.path.join(Data_Folder, "Source_Images", "Training_Images")
VoTT_Folder = os.path.join(Image_Folder, "vott-csv-export")
YOLO_filename = os.path.join(VoTT_Folder, "data_train.txt")

Model_Folder = os.path.join(Data_Folder, "Model_Weights")
YOLO_classname = os.path.join(Model_Folder, "data_classes.txt")

log_dir = Model_Folder
anchors_path = os.path.join(keras_path, "model_data", "yolo_anchors.txt")
weights_path = os.path.join(keras_path, "yolo.h5")

FLAGS = None

if __name__ == "__main__":
    # Delete all default flags
    parser = argparse.ArgumentParser(argument_default=argparse.SUPPRESS)
    """
    Command line options
    """

    parser.add_argument(
        "--annotation_file",
        type=str,
        default=YOLO_filename,
        help="Path to annotation file for Yolo. Default is " + YOLO_filename,
    )
    parser.add_argument(
        "--classes_file",
        type=str,
        default=YOLO_classname,
        help="Path to YOLO classnames. Default is " + YOLO_classname,
    )

    parser.add_argument(
        "--log_dir",
        type=str,
        default=log_dir,
        help="Folder to save training logs and trained weights to. Default is
"
        + log_dir,
    )

    parser.add_argument(
        "--anchors_path",
        type=str,
        default=anchors_path,
        help="Path to YOLO anchors. Default is " + anchors_path,
    )

    parser.add_argument(
        "--weights_path",
        type=str,
        default=weights_path,
        help="Path to pre-trained YOLO weights. Default is " + weights_path,
    )
    parser.add_argument(
        "--val_split",
        type=float,
        default=0.1,
        help="Percentage of training set to be used for validation. Default is
10%.",
    )
    parser.add_argument(
        "--is_tiny",
        default=False,
        action="store_true",
        help="Use the tiny Yolo version for better performance and less
accuracy. Default is False.",
    )
    parser.add_argument(
        "--random_seed",
        type=float,
```



```
        default=None,
        help="Random seed value to make script deterministic. Default is
'None', i.e. non-deterministic.",
    )
    parser.add_argument(
        "--epochs",
        type=float,
        default=51,
        help="Number of epochs for training last layers and number of epochs
for fine-tuning layers. Default is 51.",
    )
    parser.add_argument(
        "--warnings",
        default=False,
        action="store_true",
        help="Display warning messages. Default is False.",
    )

    FLAGS = parser.parse_args()

    if not FLAGS.warnings:
        tf.logging.set_verbosity(tf.logging.ERROR)
        os.environ['TF_CPP_MIN_LOG_LEVEL']='3'
        warnings.filterwarnings("ignore")

    np.random.seed(FLAGS.random_seed)

    log_dir = FLAGS.log_dir

    class_names = get_classes(FLAGS.classes_file)
    num_classes = len(class_names)
    anchors = get_anchors(FLAGS.anchors_path)
    weights_path = FLAGS.weights_path

    input_shape = (416, 416)  # multiple of 32, height, width
    epoch1, epoch2 = FLAGS.epochs, FLAGS.epochs

    is_tiny_version = len(anchors) == 6  # default setting
    if FLAGS.is_tiny:
        model = create_tiny_model(
            input_shape, anchors, num_classes, freeze_body=2,
weights_path=weights_path
        )
    else:
        model = create_model(
            input_shape, anchors, num_classes, freeze_body=2,
weights_path=weights_path
        )  # make sure you know what you freeze
```



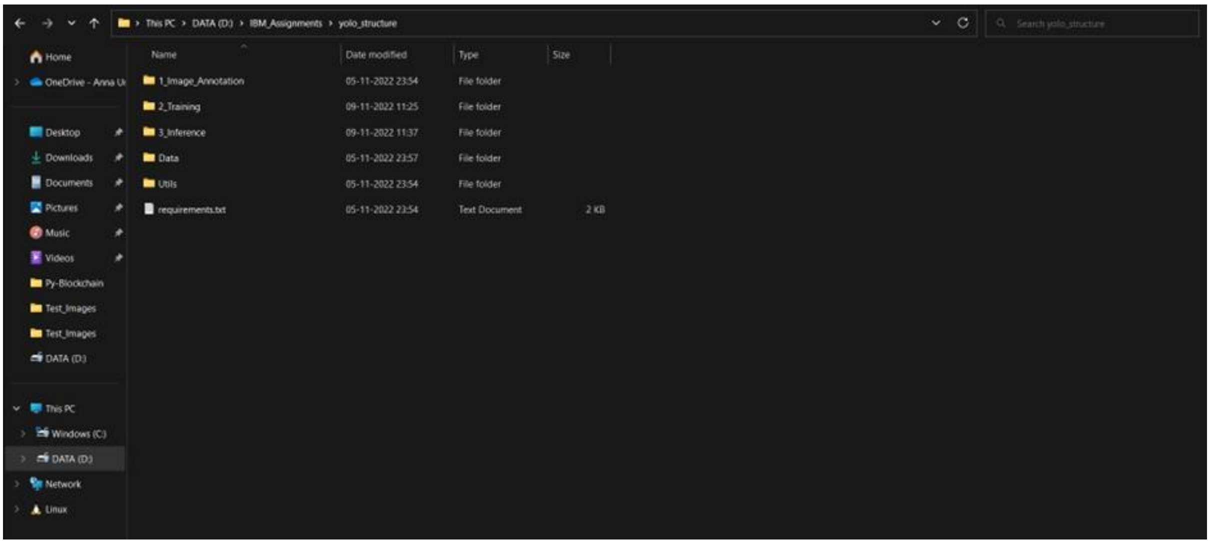
```
    log_dir_time = os.path.join(log_dir, "{}".format(int(time())))
    logging = TensorBoard(log_dir=log_dir_time)
    checkpoint = ModelCheckpoint(
        os.path.join(log_dir, "checkpoint.h5"),
        monitor="val_loss",
        save_weights_only=True,
        save_best_only=True,
        period=5,
    )
    reduce_lr = ReduceLROnPlateau(monitor="val_loss", factor=0.1, patience=3,
verbose=1)
    early_stopping = EarlyStopping(
        monitor="val_loss", min_delta=0, patience=10, verbose=1
    )

    val_split = FLAGS.val_split
    with open(FLAGS.annotation_file) as f:
        lines = f.readlines()

    # This step makes sure that the path names correspond to the local machine
    # This is important if annotation and training are done on different
machines (e.g. training on AWS)
    lines = ChangeToOtherMachine(lines, remote_machine="")
    np.random.shuffle(lines)
    num_val = int(len(lines) * val_split)
    num_train = len(lines) - num_val

    # Train with frozen layers first, to get a stable loss.
    # Adjust num epochs to your dataset. This step is enough to obtain a
decent model.
    if True:
        model.compile(
            optimizer=Adam(lr=1e-3),
            loss={
                # use custom yolo_loss Lambda layer.
                "yolo_loss": lambda y_true, y_pred: y_pred
            },
        )

        batch_size = 32
        print(
            "Train on {} samples, val on {} samples, with batch size
{}.".format(
                num_train, num_val, batch_size
            )
        )
        history = model.fit_generator(
            data_generator_wrapper(
                lines[:num_train], batch_size, input_shape, anchors,
num_classes
            ),
            steps_per_epoch=max(1, num_train // batch_size),
            validation_data=data_generator_wrapper(
                lines[num_train:], batch_size, input_shape, anchors,
num_classes
            ),
            validation_steps=max(1, num_val // batch_size),
            epochs=epoch1,
            initial_epoch=0,
            callbacks=[logging, checkpoint],
        )
        model.save_weights(os.path.join(log_dir,
"trained_weights_stage_1.h5"))

        step1_train_loss = history.history["loss"]

        file = open(os.path.join(log_dir_time, "step1_loss.npy"), "w")
        with open(os.path.join(log_dir_time, "step1_loss.npy"), "w") as f:
            for item in step1_train_loss:
                f.write("%s\n" % item)
        file.close()

        step1_val_loss = np.array(history.history["val_loss"])

        file = open(os.path.join(log_dir_time, "step1_val_loss.npy"), "w")
        with open(os.path.join(log_dir_time, "step1_val_loss.npy"), "w") as f:
            for item in step1_val_loss:
                f.write("%s\n" % item)
        file.close()

    # Unfreeze and continue training, to fine-tune.
    # Train longer if the result is unsatisfactory.
    if True:
        for i in range(len(model.layers)):
            model.layers[i].trainable = True
        model.compile(
            optimizer=Adam(lr=1e-4), loss={"yolo_loss": lambda y_true, y_pred:
y_pred}
        )  # recompile to apply the change
        print("Unfreeze all layers.")

        batch_size = (
            4  # note that more GPU memory is required after unfreezing the
body
        )
```



```
        print(
            "Train on {} samples, val on {} samples, with batch size
{}.".format(
                num_train, num_val, batch_size
            )
        )
        history = model.fit_generator(
            data_generator_wrapper(
                lines[:num_train], batch_size, input_shape, anchors,
num_classes
            ),
            steps_per_epoch=max(1, num_train // batch_size),
            validation_data=data_generator_wrapper(
                lines[num_train:], batch_size, input_shape, anchors,
num_classes
            ),
            validation_steps=max(1, num_val // batch_size),
            epochs=epoch1 + epoch2,
            initial_epoch=epoch1,
            callbacks=[logging, checkpoint, reduce_lr, early_stopping],
        )
        model.save_weights(os.path.join(log_dir, "trained_weights_final.h5"))
        step2_train_loss = history.history["loss"]

        file = open(os.path.join(log_dir_time, "step2_loss.npy"), "w")
        with open(os.path.join(log_dir_time, "step2_loss.npy"), "w") as f:
            for item in step2_train_loss:
                f.write("%s\n" % item)
        file.close()

        step2_val_loss = np.array(history.history["val_loss"])

        file = open(os.path.join(log_dir_time, "step2_val_loss.npy"), "w")
        with open(os.path.join(log_dir_time, "step2_val_loss.npy"), "w") as f:
            for item in step2_val_loss:
                f.write("%s\n" % item)
        file.close()
```

Downloading With Pre-Trained Weights:

The YOLOv3 structure model is downloaded with pre-trained weights from the Yolov3 GitHub repository. No changes re made to the structure in terms of file arrangement or the weights.



Name	Date modified	Type	Size
1_Image_Annotation	05-11-2022 23:54	File folder	
2_Training	09-11-2022 11:25	File folder	
3_Inference	09-11-2022 11:37	File folder	
Data	05-11-2022 23:57	File folder	
Utils	05-11-2022 23:54	File folder	
requirements.txt	05-11-2022 23:54	Text Document	2 KB