YOLO Reproduction-5

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1. YOLOv3 progress status

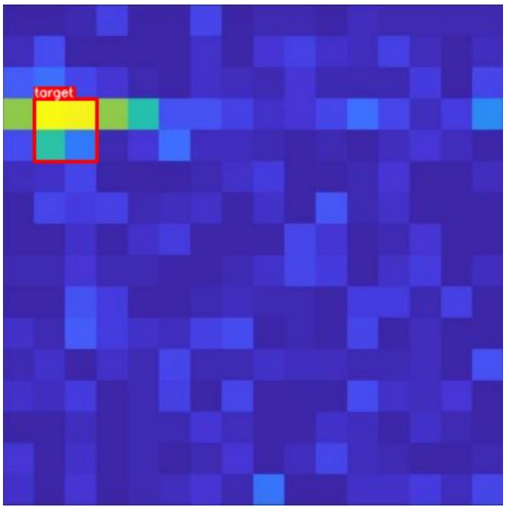
(1) it’s trainable now! (https://github.com/paulchen2713/YOLO_project)

```
(pt3.7) D:\BeginnerPythonProjects>C:/Users/paulc/.conda/envs/pt3.7/python.exe d:/BeginnerPythonProjects/YOLOv3-PyTorch/YOLOv3-0801/train.py
100%|████████████████████████████████████| 94/94 [00:43<00:00,  2.14it/s, loss=27]
Currently epoch 1
On Train loader:
100%|█████████████████████████████████████████| 94/94 [00:20<00:00,  4.54it/s]
Class accuracy is: 100.000000%
No obj accuracy is: 73.035225%
Obj accuracy is: 99.755394%
On Test loader:
100%|██████████████████████████████████████████| 7/7 [00:03<00:00,  1.81it/s]
Class accuracy is: 100.000000%
No obj accuracy is: 73.054192%
Obj accuracy is: 100.000000%
```

(2) training data

-image format: 416-by-416 .jpg files

```
D:\Datasets\RD_maps>tree
D:.
├──checks
├──images
├──labels
├──mats
├──mesh_figures
└──scaled_colors
```



```
(pt3.7) D:\BeginnerPythonProjects>C:/Users/paulc/.conda/envs/pt3.7/python.exe d:/BeginnerPythonProjects/YOLOv3-PyTorch/YOLOv3-0801/config.py
image: 229.txt
bbox: [[52.0, 104.0, 52.0, 52.0]]
```

(3) some unknown and unfixed bugs

```
RuntimeError: Given groups=1, weight of size [32, 3, 3, 3], expected input[16, 416, 416, 3] to have 3 channels, 

but got 416 channels instead
```

```
RuntimeError: result type Float can't be cast to the desired output type Byte
```

```
RuntimeError: Input type (torch.cuda.ByteTensor) and weight type (torch.cuda.HalfTensor) should be the same
```

```
ValueError: Expected y_max for bbox (0.375, 0.9375, 0.5, 1.0625, 0.0) to be in the range [0.0, 1.0]
```

Appendix.

(a) image resizing

```
def main(max_iter=1, file_type='jpg'):

    # 1600

    for i in range(1, max_iter + 1):

        # read the input image

        img = Image.open(f'D:/Datasets/RD_maps/scaled_colors/{i}_sc.{file_type}')



        # define the transform function to resize the image with given size, say 416-by-416

        transform = T.Resize(size=(416,416))



        # apply the transform on the input image

        img = transform(img)



        # overwrite the original image with the resized one

        img = img.save(f'D:/Datasets/RD_maps/scaled_colors/{i}_sc.{file_type}')

        print(f"{i}")



if __name__ == '__main__':

    # testing(1, 'jpg')

    main(1, 'jpg')
```

(b) augmentation testing with albumentations and cv2 libraries

```
def test():

    # Import the required libraries, besides albumentations and cv2

    import random

    # from PIL import Image

    import numpy as np

    from matplotlib import pyplot as plt

```

```
# Define functions to visualize bounding boxes and class labels on an image
BOX_COLOR = (255, 0, 0)      # Red
TEXT_COLOR = (255, 255, 255) # White

def visualize_bbox(img, bbox, class_name, color=BOX_COLOR, thickness=2):
    """Visualizes a single bounding box on the image"""
    # YOLO format
    x, y, w, h = bbox
    x_min, x_max = int((2*x - h) / 2), int((2*x + h) / 2)
    y_min, y_max = int((2*y - w) / 2), int((2*y + w) / 2)

    # COCO format
    # x_min, y_min, w, h = bbox
    # x_min, x_max, y_min, y_max = int(x_min), int(x_min + w), int(y_min), int(y_min + h)

    cv2.rectangle(img, (x_min, y_min), (x_max, y_max), color=color, thickness=thickness)

    ((text_width, text_height), _) = cv2.getTextSize(class_name, cv2.FONT_HERSHEY_SIMPLEX, 0.35, 1)
    cv2.rectangle(img, (x_min, y_min - int(1.3 * text_height)), (x_min + text_width, y_min), BOX_COLOR, -1)
    cv2.putText(
        img,
        text=class_name,
        org=(x_min, y_min - int(0.3 * text_height)),
        fontFace=cv2.FONT_HERSHEY_SIMPLEX,
        fontScale=0.35,
        color=TEXT_COLOR,
        lineType=cv2.LINE_AA,
    )
    return img

def visualize(image, bboxes, category_ids, category_id_to_name):
    img = image.copy()
    for bbox, category_id in zip(bboxes, category_ids):
        class_name = category_id_to_name[category_id]
        img = visualize_bbox(img, bbox, class_name)
    plt.figure(figsize=(12, 12))
    plt.axis('off')
    plt.imshow(img)
    plt.show()

# Load the image and the annotations for it
img_idx = random.randint(1, 1000) # get a random image index
```

```
    print(f"image: {img_idx}.txt")
    # we can read the image through cv2.imread() in BGR or PIL.Image.open() in RGB, but the visualiz()
    # and visualize_bbox() functions are implemented with cv2, so we should stick to it to avoid errors
    img_path = IMG_DIR + f'{img_idx}_sc.jpg'
    image = cv2.imread(img_path) # NOTE cv2.imread() read the image in BGR, 0~255, (W, H, C)
    image = cv2.cvtColor(image, cv2.COLOR_BGR2RGB) # must first convert BGR into RGB

    label_path = LABEL_DIR + f'{img_idx}.txt'
    label = np.loadtxt(fname=label_path, delimiter=" ", ndmin=2).tolist()
    # print(label[0][1:])
    true_scale = [label[0][i]*IMAGE_SIZE for i in range(1, 5)]
    # print(true_scale)

    bboxes = list()
    bboxes.append(true_scale)
    print(f"bbox: {bboxes}")

    # bboxes, category_ids and category_id_to_name all has to be iterable object
    category_ids = [0]
    category_id_to_name = {0: 'target'}

    # Visuaize the original image with bounding boxes
    # visualize(image, bboxes, category_ids, category_id_to_name)

    # Define an augmentation pipeline
    tscale = 1.5
    transform = A.Compose(
        [
            # A.LongestMaxSize(max_size=int(IMAGE_SIZE * tscale), p=1.0),
            # A.PadIfNeeded(min_height=int(IMAGE_SIZE * tscale), min_width=int(IMAGE_SIZE * tscale),
border_mode=cv2.BORDER_CONSTANT, ),

            # A.RandomCrop(width=IMAGE_SIZE, height=IMAGE_SIZE, p=1.0),

            # A.ColorJitter(brightness=0.6, contrast=0.6, saturation=0.6, hue=0.6, p=1.0),

            # A.ShiftScaleRotate(rotate_limit=20, p=1.0, border_mode=cv2.BORDER_CONSTANT),
            # A.HorizontalFlip(p=1.0),
            # A.Blur(blur_limit=7, p=1.0),
            # A.CLAHE(clip_limit=4.0, tile_grid_size=(8, 8), p=1.0),
            # A.Posterize(p=1.0),
            # A.ToGray(p=1.0),
            # A.ChannelShuffle(p=1.0),
            # A.Normalize(mean=[0, 0, 0], std=[1, 1, 1], max_pixel_value=255.0, p=1.0),
        ],
        bbox_params=A.BboxParams(
            format='coco',
            label_fields=['category_ids']
        ),
    )
    random.seed(33)
    transformed = transform(image=image, bboxes=bboxes, category_ids=category_ids)
    visualize(transformed['image'], transformed['bboxes'], transformed['category_ids'], category_id_to_name)
    # Clipping input data to the valid range for imshow with RGB data ([0..1] for floats or [0..255] for
integers)
if __name__ == "__main__":
    test()
```

(c) dataset testing

```
def test():
    anchors = config.ANCHORS

    transform = config.test_transforms

    # S = [2, 4, 8]
    # S = [13, 26, 52]
    S = config.S

    # PASCAL VOC "D:/Datasets/PASCAL_VOC/train.csv", "D:/Datasets/PASCAL_VOC/images",
"D:/Datasets/PASCAL_VOC/labels",
    # MS COCO    "COCO/train.csv", "COCO/images/images/", "COCO/labels/labels_new/"
    dataset = YOLODataset(
        "D:/Datasets/RD_maps/train.csv", # csv_file
        "D:/Datasets/RD_maps/scaled_colors",    # img_dir
        "D:/Datasets/RD_maps/labels",    # label_dir
        S=S, # S=[13, 26, 52],
        anchors=anchors,
        transform=transform,
    )
    scaled_anchors = torch.tensor(anchors) / (1 / torch.tensor(S).unsqueeze(1).unsqueeze(1).repeat(1, 3, 2))
    loader = DataLoader(dataset=dataset, batch_size=1, shuffle=True)

    counter = 0 # count number of tests
```

```python
    for x, y in loader:
        # print(f"x[0] shape: {x[0].shape}") # NOTE torch.Size([416, 416, 3])
        boxes = []

        for i in range(y[0].shape[1]):
            anchor = scaled_anchors[i]
            print(f"anchor.shape: {anchor.shape}") # torch.Size([3, 2])
            print(f"y[{i}].shape: {y[i].shape}")
            # y[0].shape: torch.Size([1, 3, 13, 13, 6])
            # y[1].shape: torch.Size([1, 3, 26, 26, 6])
            # y[2].shape: torch.Size([1, 3, 52, 52, 6])
            boxes += cells_to_bboxes(y[i], is_preds=False, S=y[i].shape[2], anchors=anchor)[0]

        boxes = nms(boxes, iou_threshold=1, threshold=0.7, box_format="midpoint")
        print(f"boxes: {boxes}")
        # plot_image(x[0].permute(1, 2, 0).to("cpu"), boxes) # torch.Size([416, 416, 3])

        #
        # TypeError: Invalid shape (3, 416, 416) for image data

        # x[0].permute(0, 1, 2).shape is the original shape with torch.Size([3, 416, 416]) and it's an Invalid shape for image data
        # so x[0].permute(1, 2, 0).shape is the valid shape with torch.Size([416, 416, 3])
        print("original shape: ", x[0].permute(0, 1, 2).shape) # torch.Size([3, 416, 416])
        plot_image(x[0].permute(1, 2, 0).to("cpu"), boxes) #
        print("-----------------------------------------")

        counter += 1
        if counter == 1: break # run the test for some times then we stop

        # sometimes would run into out of bound ValueError, NOTE probabily caused by transforms, scale, and bbox_params settings!
        # File "C:\Users\paulc\.conda\envs\pt3.7\lib\site-packages\albumentations\augmentations\bbox_utils.py", line 330, in check_bbox
        #     "to be in the range [0.0, 1.0], got {value}.".format(bbox=bbox, name=name, value=value)
        # ValueError: Expected x_max for bbox (0.9375, 0.875, 1.0625, 1.0, 0.0) to be in the range [0.0, 1.0], got 1.0625.


if __name__ == "__main__":
    test()
```