

C7082-Techiques in Machine learning and AI

Student Id

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Github link

<https://github.com/kksam2705/Techniques-in-ML-and-AI.git> (<https://github.com/kksam2705/Techniques-in-ML-and-AI.git>)

Background

The aim of this project is to detect the animals that are living in the Aquariums. we will draw the bounding boxes and detect the classes of the animals. For detection we are going to use the YOLOV5 model. you only look once is the meaning of YOLOV5 is an algorithm that uses neural networks to provide real time object detection. it will detect between various objects in digital images and videos. And we also use tensorflow to display our graphs.

Objective

Climate change made huge difference in degradation of Aquatic animals and coral reefs. The preservation of coral reefs and marine life depends on underwater health monitoring. In this project, we'll use computer vision and deep learning to create an aquarium object recognition system.

Methods

Data source

<https://public.roboflow.com/object-detection/aquarium> (<https://public.roboflow.com/object-detection/aquarium>)

Dataset Details

This dataset consists of 638 photos gathered by Roboflow from two aquariums in the United States. The National Aquarium in Baltimore and the Henry Doorly Zoo in Omaha (both on October 16, 2020). (November 14, 2020). This dataset was collected to identify objects. There are seven classes listed below.

1. Fish
2. stingray
3. jellyfish
4. penguin
5. shark
6. puffin
7. starfish

For training this model we are going to use train and split method. That means for train we use 70% of images and for split 20% images and for validation 10% of images.

The reason for using train-split method is used to estimate the performance of the Machine learning algorithms that are applicable for prediction based algorithms and applications. This method is fast and easy procedure to perform such that we can compare our own machine learning model results to machine results.

In []:

```
#clone YOLOv5
!git clone https://github.com/ultralytics/yolov5 # clone repo
%cd yolov5
%pip install -qr requirements.txt # install dependencies
%pip install -q roboflow

import torch
import os
from IPython.display import Image, clear_output # to display images

print(f"Setup complete. Using torch {torch.__version__} ({torch.cuda.get_device_properties(0).name if torch.cuda.is_available() else 'CPU'})")
```

Cloning into 'yolov5'...

remote: Enumerating objects: 14995, done.

remote: Total 14995 (delta 0), reused 0 (delta 0), pack-reused 14995

Receiving objects: 100% (14995/14995), 14.02 MiB | 31.54 MiB/s, done.

Resolving deltas: 100% (10286/10286), done.

/content/yolov5

```
_____ 184.0/184.0 KB 7.1 MB/s eta 0:00:00
_____ 62.7/62.7 KB 6.3 MB/s eta 0:00:00
_____ 1.6/1.6 MB 48.5 MB/s eta 0:00:00
_____ 46.5/46.5 KB 3.4 MB/s eta 0:00:00
_____ 67.8/67.8 KB 8.2 MB/s eta 0:00:00
```

Preparing metadata (setup.py) ... done

```
_____ 54.5/54.5 KB 6.4 MB/s eta 0:00:00
_____ 138.5/138.5 KB 16.0 MB/s eta 0:00:00
```

Building wheel for wget (setup.py) ... done

Setup complete. Using torch 1.13.1+cu116 (Tesla T4)

create our database

We must put together a dataset of typical photos with bounding box annotations surrounding the things we wish to detect in order to train our custom model. Additionally, we require a dataset in YOLOv5 format.

For this we are using the roboflow.Roboflow is an open AI that will annotate the images and draw bounding boxes.it makes us easy to train our model.

In []:

```
from roboflow import Roboflow
rf = Roboflow(model_format="yolov5", notebook="ultralytics")
```

upload and label your dataset, and get an API KEY here: <https://app.roboflow.com/?model=yolov5&ref=ultralytics>

In []:

```
# set up environment to save our dataset
os.environ["DATASET_DIRECTORY"] = "/content/datasets"
```

In []:

```
#import the dataset to google colab
!pip install roboflow
from roboflow import Roboflow
rf = Roboflow(api_key="TypZZgpMSpKK7oNxPV26")
project = rf.workspace("kk-fgzul").project("fish-x35tq")
dataset = project.version(1).download("yolov5")
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: roboflow in /usr/local/lib/python3.8/dist-packages (0.2.25)
Requirement already satisfied: kiwisolver>=1.3.1 in /usr/local/lib/python3.8/dist-packages (from rob
oflow) (1.4.4)
Requirement already satisfied: urllib3==1.26.6 in /usr/local/lib/python3.8/dist-packages (from robof
low) (1.26.6)
Requirement already satisfied: six in /usr/local/lib/python3.8/dist-packages (from roboflow) (1.15.0
)
Requirement already satisfied: pyparsing==2.4.7 in /usr/local/lib/python3.8/dist-packages (from robo
flow) (2.4.7)
Requirement already satisfied: PyYAML>=5.3.1 in /usr/local/lib/python3.8/dist-packages (from roboflo
w) (6.0)
Requirement already satisfied: opencv-python-headless>=4.5.1.48 in /usr/local/lib/python3.8/dist-pac
kages (from roboflow) (4.7.0.68)
Requirement already satisfied: tqdm>=4.41.0 in /usr/local/lib/python3.8/dist-packages (from roboflow
) (4.64.1)
Requirement already satisfied: cycler==0.10.0 in /usr/local/lib/python3.8/dist-packages (from robofl
ow) (0.10.0)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.8/dist-packages (from roboflow)
(3.2.2)
Requirement already satisfied: python-dotenv in /usr/local/lib/python3.8/dist-packages (from roboflo
w) (0.21.0)
Requirement already satisfied: requests in /usr/local/lib/python3.8/dist-packages (from roboflow) (2
.25.1)
Requirement already satisfied: requests-toolbelt in /usr/local/lib/python3.8/dist-packages (from rob
oflow) (0.10.1)
Requirement already satisfied: idna==2.10 in /usr/local/lib/python3.8/dist-packages (from roboflow)
(2.10)
Requirement already satisfied: certifi==2022.12.7 in /usr/local/lib/python3.8/dist-packages (from ro
boflow) (2022.12.7)
Requirement already satisfied: Pillow>=7.1.2 in /usr/local/lib/python3.8/dist-packages (from roboflo
w) (7.1.2)
Requirement already satisfied: numpy>=1.18.5 in /usr/local/lib/python3.8/dist-packages (from roboflo
w) (1.21.6)
Requirement already satisfied: python-dateutil in /usr/local/lib/python3.8/dist-packages (from robof
low) (2.8.2)
Requirement already satisfied: wget in /usr/local/lib/python3.8/dist-packages (from roboflow) (3.2)
Requirement already satisfied: glob2 in /usr/local/lib/python3.8/dist-packages (from roboflow) (0.7)
Requirement already satisfied: chardet==4.0.0 in /usr/local/lib/python3.8/dist-packages (from robofl
ow) (4.0.0)
loading Roboflow workspace...
loading Roboflow project...
Downloading Dataset Version Zip in /content/datasets/fish-1 to yolov5pytorch: 100% [37971512 / 37971
512] bytes
Extracting Dataset Version Zip to /content/datasets/fish-1 in yolov5pytorch:: 100%|██████████| 1286/
1286 [00:00<00:00, 2274.09it/s]
```

Develop our model

1. img: define the input picture size using img.
2. batch: Determine the batch size.
3. epochs: specify how many training epochs there are.
4. data: The dataset location for our project has been stored.
5. Weights: Define a starting path for weights. transmit knowledge gained. In this case, we pick the standard COCO pretrained checkpoint.
6. cache: pictures should be cached for quicker training.

In []:

```
!python train.py --img 416 --batch 16 --epochs 400 --data {dataset.location}/data.yaml --weights yolov5s.pt --cac
he
```

```
train: weights=yolov5s.pt, cfg=, data=/content/datasets/fish-1/data.yaml, hyp=data/hyps/hyp.scratch-
low.yaml, epochs=400, batch_size=16, imgsz=416, rect=False, resume=False, nosave=False, noval=False,
noautoanchor=False, noplots=False, evolve=None, bucket=, cache=ram, image_weights=False, device=,
multi_scale=False, single_cls=False, optimizer=SGD, sync_bn=False, workers=8, project=runs/train, name
=exp, exist_ok=False, quad=False, cos_lr=False, label_smoothing=0.0, patience=100, freeze=[0], save_
period=-1, seed=0, local_rank=-1, entity=None, upload_dataset=False, bbox_interval=-1, artifact_alia
s=latest
```

```
github: up to date with https://github.com/ultralytics/yolov5 ✓
YOLOv5 v7.0-71-gc442a2e Python-3.8.10 torch-1.13.1+cu116 CUDA:0 (Tesla T4, 15110MiB)
```

hyperparameters: lr0=0.01, lrf=0.01, momentum=0.937, weight_decay=0.0005, warmup_epochs=3.0, warmup_momentum=0.8, warmup_bias_lr=0.1, box=0.05, cls=0.5, cls_pw=1.0, obj=1.0, obj_pw=1.0, iou_t=0.2, anc_har_t=4.0, fl_gamma=0.0, hsv_h=0.015, hsv_s=0.7, hsv_v=0.4, degrees=0.0, translate=0.1, scale=0.5, shear=0.0, perspective=0.0, flipud=0.0, fliplr=0.5, mosaic=1.0, mixup=0.0, copy_paste=0.0
ClearML: run 'pip install clearml' to automatically track, visualize and remotely train YOLOv5 in ClearML

Comet: run 'pip install comet_ml' to automatically track and visualize YOLOv5 runs in Comet

TensorBoard: Start with 'tensorboard --logdir runs/train', view at <http://localhost:6006/>

Downloading <https://ultralytics.com/assets/Arial.ttf> to /root/.config/Ultralytics/Arial.ttf...

100% 755k/755k [00:00<00:00, 29.8MB/s]

Downloading <https://github.com/ultralytics/yolov5/releases/download/v7.0/yolov5s.pt> to yolov5s.pt...

100% 14.1M/14.1M [00:00<00:00, 200MB/s]

Overriding model.yaml nc=80 with nc=7

	from	n	params	module	arguments
0		-1	1	3520	models.common.Conv
1		-1	1	18560	models.common.Conv
2		-1	1	18816	models.common.C3
3		-1	1	73984	models.common.Conv
4		-1	2	115712	models.common.C3
5		-1	1	295424	models.common.Conv
6		-1	3	625152	models.common.C3
7		-1	1	1180672	models.common.Conv
8		-1	1	1182720	models.common.C3
9		-1	1	656896	models.common.SPPF
10		-1	1	131584	models.common.Conv
11		-1	1	0	torch.nn.modules.upsampling.Upsample
12		[-1, 6]	1	0	models.common.Concat
13		-1	1	361984	models.common.C3
14		-1	1	33024	models.common.Conv
15		-1	1	0	torch.nn.modules.upsampling.Upsample
16		[-1, 4]	1	0	models.common.Concat
17		-1	1	90880	models.common.C3
18		-1	1	147712	models.common.Conv
19		[-1, 14]	1	0	models.common.Concat
20		-1	1	296448	models.common.C3
21		-1	1	590336	models.common.Conv
22		[-1, 10]	1	0	models.common.Concat
23		-1	1	1182720	models.common.C3
24		[17, 20, 23]	1	32364	models.yolo.Detect
					[7, [[10, 13, 16, 30, 33, 23], [30, 61, 62, 45, 59, 119], [116, 90, 156, 198, 373, 326]], [128, 256, 512]]]

Model summary: 214 layers, 7038508 parameters, 7038508 gradients, 16.0 GFLOPs

Transferred 343/349 items from yolov5s.pt

AMP: checks passed ✓

optimizer: SGD(lr=0.01) with parameter groups 57 weight(decay=0.0), 60 weight(decay=0.0005), 60 bias

albumentations: Blur(p=0.01, blur_limit=(3, 7)), MedianBlur(p=0.01, blur_limit=(3, 7)), ToGray(p=0.01), CLAHE(p=0.01, clip_limit=(1, 4.0), tile_grid_size=(8, 8))

train: Scanning /content/datasets/fish-1/train/labels... 446 images, 0 backgrounds, 0 corrupt: 100% 446/446 [00:00<00:00, 1920.25it/s]

train: New cache created: /content/datasets/fish-1/train/labels.cache

train: Caching images (0.2GB ram): 100% 446/446 [00:02<00:00, 149.32it/s]

val: Scanning /content/datasets/fish-1/valid/labels... 128 images, 0 backgrounds, 0 corrupt: 100% 128/128 [00:00<00:00, 588.68it/s]

val: New cache created: /content/datasets/fish-1/valid/labels.cache

val: Caching images (0.1GB ram): 100% 128/128 [00:01<00:00, 91.57it/s]

AutoAnchor: 4.66 anchors/target, 0.999 Best Possible Recall (BPR). Current anchors are a good fit to dataset ✓

Plotting labels to runs/train/exp/labels.jpg...

Image sizes 416 train, 416 val

Using 2 dataloader workers

Logging results to runs/train/exp

Starting training for 400 epochs...

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
0/399	1.71G	0.1169	0.0445	0.06014	118	416: 100% 28/28 [00:10<00:00, 2.56it/s]
00, 2.56it/s]	Class	Images	Instances	P	R	mAP50 mAP50-95: 100% 4/4 [
00:02<00:00, 1.80it/s]	all	128	993	0.00471	0.258	0.00541 0.00131
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
1/399	2.07G	0.09639	0.05816	0.04905	168	416: 100% 28/28 [00:05<00:00, 5.18it/s]
00, 5.18it/s]	Class	Images	Instances	P	R	mAP50 mAP50-95: 100% 4/4 [
00:01<00:00, 2.09it/s]	all	128	993	0.0147	0.142	0.0158 0.00409
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
2/399	2.07G	0.08398	0.05357	0.04337	189	416: 100% 28/28 [00:05<00:00, 5.14it/s]

00:02<00:00,	Class all	1.94it/s]	Images 128	Instances 993	P 0.799	R 0.104	mAP50 0.1	mAP50-95: 100% 4/4 [
00, 5.24it/s]	Epoch 3/399	GPU_mem 2.07G	box_loss 0.0789	obj_loss 0.05171	cls_loss 0.04112	Instances 146	Size 416:	100% 28/28 [00:05<00:
00:01<00:00,	Class all	3.41it/s]	Images 128	Instances 993	P 0.152	R 0.25	mAP50 0.118	mAP50-95: 100% 4/4 [
00, 5.28it/s]	Epoch 4/399	GPU_mem 2.07G	box_loss 0.07428	obj_loss 0.05138	cls_loss 0.03638	Instances 161	Size 416:	100% 28/28 [00:05<00:
00:01<00:00,	Class all	2.91it/s]	Images 128	Instances 993	P 0.683	R 0.182	mAP50 0.164	mAP50-95: 100% 4/4 [
00, 4.88it/s]	Epoch 5/399	GPU_mem 2.07G	box_loss 0.06958	obj_loss 0.04762	cls_loss 0.03148	Instances 176	Size 416:	100% 28/28 [00:05<00:
00:01<00:00,	Class all	3.12it/s]	Images 128	Instances 993	P 0.121	R 0.439	mAP50 0.18	mAP50-95: 100% 4/4 [
00, 3.84it/s]	Epoch 6/399	GPU_mem 2.07G	box_loss 0.06616	obj_loss 0.04905	cls_loss 0.02949	Instances 168	Size 416:	100% 28/28 [00:07<00:
00:01<00:00,	Class all	2.31it/s]	Images 128	Instances 993	P 0.16	R 0.479	mAP50 0.225	mAP50-95: 100% 4/4 [
00, 4.81it/s]	Epoch 7/399	GPU_mem 2.07G	box_loss 0.06266	obj_loss 0.04948	cls_loss 0.02781	Instances 158	Size 416:	100% 28/28 [00:05<00:
00:00<00:00,	Class all	4.07it/s]	Images 128	Instances 993	P 0.252	R 0.482	mAP50 0.308	mAP50-95: 100% 4/4 [
00, 4.75it/s]	Epoch 8/399	GPU_mem 2.07G	box_loss 0.06072	obj_loss 0.04752	cls_loss 0.02477	Instances 122	Size 416:	100% 28/28 [00:05<00:
00:01<00:00,	Class all	3.48it/s]	Images 128	Instances 993	P 0.271	R 0.492	mAP50 0.329	mAP50-95: 100% 4/4 [
00, 5.00it/s]	Epoch 9/399	GPU_mem 2.07G	box_loss 0.0604	obj_loss 0.04851	cls_loss 0.02403	Instances 181	Size 416:	100% 28/28 [00:05<00:
00:01<00:00,	Class all	3.71it/s]	Images 128	Instances 993	P 0.289	R 0.483	mAP50 0.36	mAP50-95: 100% 4/4 [
00, 3.80it/s]	Epoch 10/399	GPU_mem 2.07G	box_loss 0.05844	obj_loss 0.04651	cls_loss 0.02257	Instances 102	Size 416:	100% 28/28 [00:07<00:
00:01<00:00,	Class all	3.36it/s]	Images 128	Instances 993	P 0.369	R 0.481	mAP50 0.423	mAP50-95: 100% 4/4 [
00, 4.83it/s]	Epoch 11/399	GPU_mem 2.07G	box_loss 0.05714	obj_loss 0.04781	cls_loss 0.02083	Instances 129	Size 416:	100% 28/28 [00:05<00:
00:00<00:00,	Class all	4.33it/s]	Images 128	Instances 993	P 0.355	R 0.528	mAP50 0.398	mAP50-95: 100% 4/4 [
00, 4.43it/s]	Epoch 12/399	GPU_mem 2.07G	box_loss 0.05633	obj_loss 0.04954	cls_loss 0.02113	Instances 140	Size 416:	100% 28/28 [00:06<00:
00:01<00:00,	Class all	4.00it/s]	Images 128	Instances 993	P 0.412	R 0.554	mAP50 0.466	mAP50-95: 100% 4/4 [
00, 4.36it/s]	Epoch 13/399	GPU_mem 2.07G	box_loss 0.05522	obj_loss 0.04496	cls_loss 0.01974	Instances 115	Size 416:	100% 28/28 [00:06<00:
00:01<00:00,	Class all	3.61it/s]	Images 128	Instances 993	P 0.444	R 0.537	mAP50 0.465	mAP50-95: 100% 4/4 [
00, 4.21it/s]	Epoch 14/399	GPU_mem 2.07G	box_loss 0.05499	obj_loss 0.04565	cls_loss 0.01846	Instances 112	Size 416:	100% 28/28 [00:05<00:

00, 4.91it/s]		Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:01<00:00, 3.69it/s]	all		128	993	0.532	0.565	0.522	0.246
Epoch 15/399	GPU_mem 2.07G	box_loss 0.05464	obj_loss 0.0474	cls_loss 0.01701	Instances 162	Size 416: 100% 28/28 [00:05<00:		
00, 4.71it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.44it/s]	all		128	993	0.613	0.549	0.592	0.298
Epoch 16/399	GPU_mem 2.07G	box_loss 0.05299	obj_loss 0.04315	cls_loss 0.01769	Instances 113	Size 416: 100% 28/28 [00:05<00:		
00, 5.33it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.61it/s]	all		128	993	0.651	0.568	0.596	0.255
Epoch 17/399	GPU_mem 2.07G	box_loss 0.05317	obj_loss 0.04575	cls_loss 0.01428	Instances 241	Size 416: 100% 28/28 [00:05<00:		
00, 5.20it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.53it/s]	all		128	993	0.758	0.598	0.674	0.335
Epoch 18/399	GPU_mem 2.07G	box_loss 0.05128	obj_loss 0.04602	cls_loss 0.01409	Instances 115	Size 416: 100% 28/28 [00:05<00:		
00, 5.08it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.14it/s]	all		128	993	0.749	0.598	0.648	0.329
Epoch 19/399	GPU_mem 2.07G	box_loss 0.05223	obj_loss 0.04684	cls_loss 0.01281	Instances 130	Size 416: 100% 28/28 [00:06<00:		
00, 4.57it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.39it/s]	all		128	993	0.735	0.576	0.657	0.316
Epoch 20/399	GPU_mem 2.07G	box_loss 0.05192	obj_loss 0.04331	cls_loss 0.01224	Instances 175	Size 416: 100% 28/28 [00:07<00:		
00, 3.79it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.18it/s]	all		128	993	0.731	0.612	0.652	0.336
Epoch 21/399	GPU_mem 2.07G	box_loss 0.05058	obj_loss 0.04394	cls_loss 0.01199	Instances 123	Size 416: 100% 28/28 [00:05<00:		
00, 5.31it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.11it/s]	all		128	993	0.728	0.631	0.696	0.35
Epoch 22/399	GPU_mem 2.07G	box_loss 0.05189	obj_loss 0.04381	cls_loss 0.01179	Instances 149	Size 416: 100% 28/28 [00:05<00:		
00, 5.19it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.61it/s]	all		128	993	0.734	0.607	0.665	0.326
Epoch 23/399	GPU_mem 2.07G	box_loss 0.05108	obj_loss 0.04442	cls_loss 0.01061	Instances 86	Size 416: 100% 28/28 [00:05<00:		
00, 5.23it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.54it/s]	all		128	993	0.708	0.671	0.69	0.333
Epoch 24/399	GPU_mem 2.07G	box_loss 0.04938	obj_loss 0.04353	cls_loss 0.009887	Instances 175	Size 416: 100% 28/28 [00:05<00:		
00, 5.30it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.35it/s]	all		128	993	0.782	0.592	0.695	0.351
Epoch 25/399	GPU_mem 2.07G	box_loss 0.05064	obj_loss 0.04347	cls_loss 0.009374	Instances 214	Size 416: 100% 28/28 [00:06<00:		
00, 4.31it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:01<00:00, 3.13it/s]	all		128	993	0.765	0.62	0.706	0.331
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		

26/399 00, 5.17it/s]	2.07G	0.0498	0.04446	0.00826	144	416:	100%	28/28 [00:05<00:
00:00<00:00, 4.47it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
		128	993	0.705	0.624	0.675	0.326	
Epoch 27/399 00, 5.15it/s]	GPU_mem 2.07G	box_loss 0.04876	obj_loss 0.04218	cls_loss 0.008837	Instances 226	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.47it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
		128	993	0.743	0.599	0.678	0.344	
Epoch 28/399 00, 5.29it/s]	GPU_mem 2.07G	box_loss 0.04902	obj_loss 0.04333	cls_loss 0.008695	Instances 108	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.19it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
		128	993	0.737	0.64	0.714	0.348	
Epoch 29/399 00, 5.20it/s]	GPU_mem 2.07G	box_loss 0.0481	obj_loss 0.04336	cls_loss 0.008077	Instances 168	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.61it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
		128	993	0.774	0.664	0.711	0.379	
Epoch 30/399 00, 5.26it/s]	GPU_mem 2.07G	box_loss 0.04933	obj_loss 0.04225	cls_loss 0.007511	Instances 133	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.62it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
		128	993	0.716	0.631	0.691	0.336	
Epoch 31/399 00, 5.06it/s]	GPU_mem 2.07G	box_loss 0.04913	obj_loss 0.04301	cls_loss 0.007104	Instances 92	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.82it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
		128	993	0.785	0.637	0.711	0.342	
Epoch 32/399 00, 5.24it/s]	GPU_mem 2.07G	box_loss 0.04846	obj_loss 0.04164	cls_loss 0.007358	Instances 175	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.51it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
		128	993	0.807	0.676	0.752	0.393	
Epoch 33/399 00, 5.32it/s]	GPU_mem 2.07G	box_loss 0.04753	obj_loss 0.04227	cls_loss 0.007231	Instances 97	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.45it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
		128	993	0.716	0.675	0.705	0.367	
Epoch 34/399 00, 5.29it/s]	GPU_mem 2.07G	box_loss 0.04719	obj_loss 0.04263	cls_loss 0.006953	Instances 156	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.85it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
		128	993	0.778	0.665	0.717	0.377	
Epoch 35/399 00, 5.16it/s]	GPU_mem 2.07G	box_loss 0.04613	obj_loss 0.03955	cls_loss 0.007541	Instances 146	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.70it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
		128	993	0.767	0.644	0.723	0.359	
Epoch 36/399 00, 5.32it/s]	GPU_mem 2.07G	box_loss 0.04843	obj_loss 0.03919	cls_loss 0.007373	Instances 133	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.60it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
		128	993	0.769	0.621	0.702	0.365	
Epoch 37/399 00, 5.21it/s]	GPU_mem 2.07G	box_loss 0.04829	obj_loss 0.04111	cls_loss 0.006599	Instances 217	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.55it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
		128	993	0.769	0.669	0.731	0.368	

Epoch 38/399	GPU_mem 2.07G	box_loss 0.04774	obj_loss 0.04215	cls_loss 0.006241	Instances 210	Size 416:	100% 28/28 [00:05<00: 00, 4.88it/s]
00:00<00:00,	Class all	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:01<00:00,	Class all	128	993	0.817	0.696	0.772	0.372
Epoch 39/399	GPU_mem 2.07G	box_loss 0.04816	obj_loss 0.04372	cls_loss 0.006233	Instances 184	Size 416:	100% 28/28 [00:05<00: 00, 5.19it/s]
00:00<00:00,	Class all	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:01<00:00,	Class all	128	993	0.789	0.671	0.758	0.414
Epoch 40/399	GPU_mem 2.07G	box_loss 0.04538	obj_loss 0.03996	cls_loss 0.006558	Instances 122	Size 416:	100% 28/28 [00:05<00: 00, 5.19it/s]
00:00<00:00,	Class all	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:01<00:00,	Class all	128	993	0.823	0.645	0.756	0.404
Epoch 41/399	GPU_mem 2.07G	box_loss 0.04665	obj_loss 0.04128	cls_loss 0.00641	Instances 121	Size 416:	100% 28/28 [00:05<00: 00, 5.32it/s]
00:00<00:00,	Class all	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:01<00:00,	Class all	128	993	0.773	0.667	0.743	0.381
Epoch 42/399	GPU_mem 2.07G	box_loss 0.04605	obj_loss 0.03931	cls_loss 0.006054	Instances 166	Size 416:	100% 28/28 [00:05<00: 00, 5.29it/s]
00:00<00:00,	Class all	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:01<00:00,	Class all	128	993	0.768	0.686	0.749	0.406
Epoch 43/399	GPU_mem 2.07G	box_loss 0.04601	obj_loss 0.03979	cls_loss 0.006124	Instances 111	Size 416:	100% 28/28 [00:05<00: 00, 5.33it/s]
00:00<00:00,	Class all	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:01<00:00,	Class all	128	993	0.801	0.675	0.74	0.395
Epoch 44/399	GPU_mem 2.07G	box_loss 0.04611	obj_loss 0.04034	cls_loss 0.006076	Instances 60	Size 416:	100% 28/28 [00:05<00: 00, 5.31it/s]
00:00<00:00,	Class all	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:01<00:00,	Class all	128	993	0.799	0.664	0.744	0.397
Epoch 45/399	GPU_mem 2.07G	box_loss 0.04624	obj_loss 0.03954	cls_loss 0.005589	Instances 134	Size 416:	100% 28/28 [00:05<00: 00, 5.18it/s]
00:00<00:00,	Class all	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:01<00:00,	Class all	128	993	0.751	0.687	0.765	0.404
Epoch 46/399	GPU_mem 2.07G	box_loss 0.04691	obj_loss 0.04189	cls_loss 0.005411	Instances 173	Size 416:	100% 28/28 [00:05<00: 00, 5.14it/s]
00:00<00:00,	Class all	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:01<00:00,	Class all	128	993	0.775	0.686	0.76	0.405
Epoch 47/399	GPU_mem 2.07G	box_loss 0.04476	obj_loss 0.0399	cls_loss 0.005895	Instances 173	Size 416:	100% 28/28 [00:05<00: 00, 5.10it/s]
00:00<00:00,	Class all	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:01<00:00,	Class all	128	993	0.779	0.715	0.776	0.409
Epoch 48/399	GPU_mem 2.07G	box_loss 0.04473	obj_loss 0.04068	cls_loss 0.005242	Instances 176	Size 416:	100% 28/28 [00:05<00: 00, 5.11it/s]
00:00<00:00,	Class all	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:01<00:00,	Class all	128	993	0.799	0.687	0.763	0.4
Epoch 49/399	GPU_mem 2.07G	box_loss 0.04546	obj_loss 0.04049	cls_loss 0.005776	Instances 139	Size 416:	100% 28/28 [00:07<00: 00, 3.69it/s]
00:01<00:00,	Class all	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:01<00:00,	Class all	128	993	0.812	0.662	0.765	0.395

Epoch 50/399 00, 3.68it/s]	GPU_mem 2.07G	box_loss 0.04557	obj_loss 0.04078	cls_loss 0.005014	Instances 167	Size 416: 100% 28/28 [00:07<00: 00:00<00:00, 4.79it/s] all	mAP50 mAP50-95: 100% 4/4 [0.76 0.399
Epoch 51/399 00, 4.96it/s]	GPU_mem 2.07G	box_loss 0.04471	obj_loss 0.03986	cls_loss 0.005029	Instances 113	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.62it/s] all	mAP50 mAP50-95: 100% 4/4 [0.761 0.4
Epoch 52/399 00, 5.25it/s]	GPU_mem 2.07G	box_loss 0.04437	obj_loss 0.03823	cls_loss 0.005286	Instances 115	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.67it/s] all	mAP50 mAP50-95: 100% 4/4 [0.752 0.411
Epoch 53/399 00, 4.96it/s]	GPU_mem 2.07G	box_loss 0.04304	obj_loss 0.03887	cls_loss 0.00526	Instances 143	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.75it/s] all	mAP50 mAP50-95: 100% 4/4 [0.755 0.414
Epoch 54/399 00, 2.96it/s]	GPU_mem 2.07G	box_loss 0.0439	obj_loss 0.0384	cls_loss 0.004443	Instances 182	Size 416: 100% 28/28 [00:09<00: 00:00<00:00, 4.28it/s] all	mAP50 mAP50-95: 100% 4/4 [0.745 0.401
Epoch 55/399 00, 5.17it/s]	GPU_mem 2.07G	box_loss 0.04329	obj_loss 0.03963	cls_loss 0.004856	Instances 122	Size 416: 100% 28/28 [00:05<00: 00:01<00:00, 3.58it/s] all	mAP50 mAP50-95: 100% 4/4 [0.773 0.425
Epoch 56/399 00, 5.14it/s]	GPU_mem 2.07G	box_loss 0.0425	obj_loss 0.03852	cls_loss 0.004776	Instances 141	Size 416: 100% 28/28 [00:05<00: 00:01<00:00, 3.45it/s] all	mAP50 mAP50-95: 100% 4/4 [0.778 0.422
Epoch 57/399 00, 3.86it/s]	GPU_mem 2.07G	box_loss 0.04389	obj_loss 0.04102	cls_loss 0.004347	Instances 224	Size 416: 100% 28/28 [00:07<00: 00:01<00:00, 3.69it/s] all	mAP50 mAP50-95: 100% 4/4 [0.768 0.427
Epoch 58/399 00, 5.01it/s]	GPU_mem 2.07G	box_loss 0.04349	obj_loss 0.04076	cls_loss 0.004174	Instances 134	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.55it/s] all	mAP50 mAP50-95: 100% 4/4 [0.757 0.393
Epoch 59/399 00, 5.26it/s]	GPU_mem 2.07G	box_loss 0.04428	obj_loss 0.039	cls_loss 0.004639	Instances 129	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.75it/s] all	mAP50 mAP50-95: 100% 4/4 [0.769 0.419
Epoch 60/399 00, 5.20it/s]	GPU_mem 2.07G	box_loss 0.04282	obj_loss 0.03838	cls_loss 0.004444	Instances 129	Size 416: 100% 28/28 [00:05<00: 00:01<00:00, 3.56it/s] all	mAP50 mAP50-95: 100% 4/4 [0.765 0.418
Epoch 61/399 00, 5.19it/s]	GPU_mem 2.07G	box_loss 0.04348	obj_loss 0.03922	cls_loss 0.004368	Instances 143	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.71it/s] all	mAP50 mAP50-95: 100% 4/4 [0.76 0.418

		all	128	993	0.803	0.662	0.742	0.402
Epoch 62/399 00, 5.17it/s]	GPU_mem 2.07G	box_loss 0.04288	obj_loss 0.03991	cls_loss 0.00456	Instances 257	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.54it/s]	mAP50	mAP50-95: 100% 4/4 [
	Class all	Images	Instances	P	R			
Epoch 63/399 00, 5.19it/s]	GPU_mem 2.07G	box_loss 0.04309	obj_loss 0.03781	cls_loss 0.004396	Instances 170	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.74it/s]	mAP50	mAP50-95: 100% 4/4 [
	Class all	Images	Instances	P	R			
Epoch 64/399 00, 5.16it/s]	GPU_mem 2.07G	box_loss 0.04318	obj_loss 0.04128	cls_loss 0.004684	Instances 116	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.67it/s]	mAP50	mAP50-95: 100% 4/4 [
	Class all	Images	Instances	P	R			
Epoch 65/399 00, 5.18it/s]	GPU_mem 2.07G	box_loss 0.04226	obj_loss 0.03831	cls_loss 0.004544	Instances 179	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.53it/s]	mAP50	mAP50-95: 100% 4/4 [
	Class all	Images	Instances	P	R			
Epoch 66/399 00, 5.22it/s]	GPU_mem 2.07G	box_loss 0.04193	obj_loss 0.03947	cls_loss 0.004551	Instances 71	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.40it/s]	mAP50	mAP50-95: 100% 4/4 [
	Class all	Images	Instances	P	R			
Epoch 67/399 00, 5.15it/s]	GPU_mem 2.07G	box_loss 0.04159	obj_loss 0.03896	cls_loss 0.003898	Instances 134	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.72it/s]	mAP50	mAP50-95: 100% 4/4 [
	Class all	Images	Instances	P	R			
Epoch 68/399 00, 5.07it/s]	GPU_mem 2.07G	box_loss 0.04193	obj_loss 0.03722	cls_loss 0.004147	Instances 175	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.71it/s]	mAP50	mAP50-95: 100% 4/4 [
	Class all	Images	Instances	P	R			
Epoch 69/399 00, 5.27it/s]	GPU_mem 2.07G	box_loss 0.04344	obj_loss 0.03586	cls_loss 0.004153	Instances 109	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.59it/s]	mAP50	mAP50-95: 100% 4/4 [
	Class all	Images	Instances	P	R			
Epoch 70/399 00, 5.17it/s]	GPU_mem 2.07G	box_loss 0.04323	obj_loss 0.03889	cls_loss 0.004465	Instances 153	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.69it/s]	mAP50	mAP50-95: 100% 4/4 [
	Class all	Images	Instances	P	R			
Epoch 71/399 00, 5.19it/s]	GPU_mem 2.07G	box_loss 0.04161	obj_loss 0.03782	cls_loss 0.004126	Instances 221	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.49it/s]	mAP50	mAP50-95: 100% 4/4 [
	Class all	Images	Instances	P	R			
Epoch 72/399 00, 5.29it/s]	GPU_mem 2.07G	box_loss 0.04219	obj_loss 0.03724	cls_loss 0.003704	Instances 166	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.58it/s]	mAP50	mAP50-95: 100% 4/4 [
	Class all	Images	Instances	P	R			
Epoch 73/399 00, 5.29it/s]	GPU_mem 2.07G	box_loss 0.04158	obj_loss 0.03665	cls_loss 0.003915	Instances 132	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.58it/s]	mAP50	mAP50-95: 100% 4/4 [
	Class all	Images	Instances	P	R			

00:00<00:00, 4.72it/s]		all	128	993	0.786	0.689	0.777	0.433
Epoch 74/399	GPU_mem 2.07G	Class all	box_loss 0.04092	obj_loss 0.03602	cls_loss 0.003652	Instances 186	Size 416:	100% 28/28 [00:05<00:00, 5.02it/s]
00:00<00:00, 4.76it/s]		Images		Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
Epoch 75/399	GPU_mem 2.07G	Class all	box_loss 0.04149	obj_loss 0.03723	cls_loss 0.003837	Instances 143	Size 416:	100% 28/28 [00:05<00:00, 5.26it/s]
00:00<00:00, 4.54it/s]		Images		Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
Epoch 76/399	GPU_mem 2.07G	Class all	box_loss 0.04162	obj_loss 0.03756	cls_loss 0.003525	Instances 191	Size 416:	100% 28/28 [00:05<00:00, 5.21it/s]
00:00<00:00, 4.73it/s]		Images		Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
Epoch 77/399	GPU_mem 2.07G	Class all	box_loss 0.04177	obj_loss 0.03899	cls_loss 0.003651	Instances 108	Size 416:	100% 28/28 [00:07<00:00, 3.64it/s]
00:00<00:00, 4.63it/s]		Images		Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
Epoch 78/399	GPU_mem 2.07G	Class all	box_loss 0.03888	obj_loss 0.03613	cls_loss 0.003468	Instances 143	Size 416:	100% 28/28 [00:05<00:00, 5.38it/s]
00:00<00:00, 4.44it/s]		Images		Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
Epoch 79/399	GPU_mem 2.07G	Class all	box_loss 0.04029	obj_loss 0.03557	cls_loss 0.003603	Instances 131	Size 416:	100% 28/28 [00:05<00:00, 5.24it/s]
00:00<00:00, 4.74it/s]		Images		Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
Epoch 80/399	GPU_mem 2.07G	Class all	box_loss 0.04043	obj_loss 0.03565	cls_loss 0.003742	Instances 110	Size 416:	100% 28/28 [00:05<00:00, 5.27it/s]
00:00<00:00, 4.53it/s]		Images		Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
Epoch 81/399	GPU_mem 2.07G	Class all	box_loss 0.04181	obj_loss 0.0375	cls_loss 0.003583	Instances 204	Size 416:	100% 28/28 [00:05<00:00, 5.05it/s]
00:00<00:00, 4.76it/s]		Images		Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
Epoch 82/399	GPU_mem 2.07G	Class all	box_loss 0.04066	obj_loss 0.03606	cls_loss 0.003646	Instances 199	Size 416:	100% 28/28 [00:05<00:00, 5.30it/s]
00:00<00:00, 4.75it/s]		Images		Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
Epoch 83/399	GPU_mem 2.07G	Class all	box_loss 0.04104	obj_loss 0.03741	cls_loss 0.003257	Instances 203	Size 416:	100% 28/28 [00:07<00:00, 3.73it/s]
00:00<00:00, 4.80it/s]		Images		Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
Epoch 84/399	GPU_mem 2.07G	Class all	box_loss 0.04066	obj_loss 0.0366	cls_loss 0.004209	Instances 172	Size 416:	100% 28/28 [00:05<00:00, 5.24it/s]
00:00<00:00, 4.69it/s]		Images		Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
Epoch 85/399	GPU_mem 2.07G	Class all	box_loss 0.03907	obj_loss 0.03463	cls_loss 0.00398	Instances 225	Size 416:	100% 28/28 [00:05<00:00, 5.20it/s]

00:00<00:00,	Class all	4.69it/s]	Images 128	Instances 993	P 0.817	R 0.706	mAP50 0.785	mAP50-95: 100% 4/4 [
00, Epoch 86/399	GPU_mem 2.07G	box_loss 0.03953	obj_loss 0.0348	cls_loss 0.003737	Instances 118	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.56it/s]	Images 128	Instances 993	P 0.775	R 0.715	mAP50 0.758	mAP50-95: 100% 4/4 [
00, Epoch 87/399	GPU_mem 2.07G	box_loss 0.04078	obj_loss 0.0375	cls_loss 0.003581	Instances 133	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.66it/s]	Images 128	Instances 993	P 0.762	R 0.7	mAP50 0.743	mAP50-95: 100% 4/4 [
00, Epoch 88/399	GPU_mem 2.07G	box_loss 0.03992	obj_loss 0.0362	cls_loss 0.003162	Instances 94	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.61it/s]	Images 128	Instances 993	P 0.789	R 0.736	mAP50 0.778	mAP50-95: 100% 4/4 [
00, Epoch 89/399	GPU_mem 2.07G	box_loss 0.04049	obj_loss 0.03754	cls_loss 0.003306	Instances 126	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.55it/s]	Images 128	Instances 993	P 0.82	R 0.718	mAP50 0.78	mAP50-95: 100% 4/4 [
00, Epoch 90/399	GPU_mem 2.07G	box_loss 0.03979	obj_loss 0.03483	cls_loss 0.003451	Instances 191	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.69it/s]	Images 128	Instances 993	P 0.787	R 0.723	mAP50 0.763	mAP50-95: 100% 4/4 [
00, Epoch 91/399	GPU_mem 2.07G	box_loss 0.0387	obj_loss 0.03578	cls_loss 0.003148	Instances 176	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.81it/s]	Images 128	Instances 993	P 0.792	R 0.712	mAP50 0.785	mAP50-95: 100% 4/4 [
00, Epoch 92/399	GPU_mem 2.07G	box_loss 0.03972	obj_loss 0.03634	cls_loss 0.003046	Instances 98	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.77it/s]	Images 128	Instances 993	P 0.812	R 0.719	mAP50 0.779	mAP50-95: 100% 4/4 [
00, Epoch 93/399	GPU_mem 2.07G	box_loss 0.04086	obj_loss 0.03638	cls_loss 0.003289	Instances 108	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.68it/s]	Images 128	Instances 993	P 0.885	R 0.683	mAP50 0.789	mAP50-95: 100% 4/4 [
00, Epoch 94/399	GPU_mem 2.07G	box_loss 0.03991	obj_loss 0.03589	cls_loss 0.002949	Instances 164	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.69it/s]	Images 128	Instances 993	P 0.78	R 0.731	mAP50 0.796	mAP50-95: 100% 4/4 [
00, Epoch 95/399	GPU_mem 2.07G	box_loss 0.0393	obj_loss 0.03544	cls_loss 0.002908	Instances 145	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.80it/s]	Images 128	Instances 993	P 0.851	R 0.686	mAP50 0.77	mAP50-95: 100% 4/4 [
00, Epoch 96/399	GPU_mem 2.07G	box_loss 0.03824	obj_loss 0.03485	cls_loss 0.002963	Instances 171	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.75it/s]	Images 128	Instances 993	P 0.794	R 0.673	mAP50 0.756	mAP50-95: 100% 4/4 [
00, Epoch 97/399	GPU_mem 2.07G	box_loss 0.03884	obj_loss 0.03586	cls_loss 0.003561	Instances 163	Size 416:	100% 28/28 [00:05<00:	

00, 5.10it/s]								
00:00<00:00, 4.77it/s]		Class all	Images 128	Instances 993	P 0.826	R 0.67	mAP50 0.757	mAP50-95: 100% 4/4 [
Epoch 98/399	GPU_mem 2.07G	box_loss 0.03871	obj_loss 0.03501	cls_loss 0.003374	Instances 135	Size 416: 100% 28/28 [00:05<00:		
00, 5.24it/s]		Class all	Images 128	Instances 993	P 0.817	R 0.71	0.77	0.447
Epoch 99/399	GPU_mem 2.07G	box_loss 0.03944	obj_loss 0.03579	cls_loss 0.00279	Instances 122	Size 416: 100% 28/28 [00:05<00:		
00, 5.23it/s]		Class all	Images 128	Instances 993	P 0.788	R 0.71	0.761	0.434
Epoch 100/399	GPU_mem 2.07G	box_loss 0.03957	obj_loss 0.03657	cls_loss 0.002968	Instances 140	Size 416: 100% 28/28 [00:05<00:		
00, 5.11it/s]		Class all	Images 128	Instances 993	P 0.787	R 0.734	0.775	0.437
Epoch 101/399	GPU_mem 2.07G	box_loss 0.03874	obj_loss 0.0348	cls_loss 0.003298	Instances 115	Size 416: 100% 28/28 [00:05<00:		
00, 5.21it/s]		Class all	Images 128	Instances 993	P 0.865	R 0.701	0.784	0.446
Epoch 102/399	GPU_mem 2.07G	box_loss 0.03857	obj_loss 0.03597	cls_loss 0.003032	Instances 139	Size 416: 100% 28/28 [00:05<00:		
00, 5.28it/s]		Class all	Images 128	Instances 993	P 0.794	R 0.752	0.796	0.452
Epoch 103/399	GPU_mem 2.07G	box_loss 0.03881	obj_loss 0.03726	cls_loss 0.003279	Instances 141	Size 416: 100% 28/28 [00:05<00:		
00, 5.15it/s]		Class all	Images 128	Instances 993	P 0.813	R 0.708	0.791	0.444
Epoch 104/399	GPU_mem 2.07G	box_loss 0.03918	obj_loss 0.03588	cls_loss 0.002338	Instances 122	Size 416: 100% 28/28 [00:05<00:		
00, 5.20it/s]		Class all	Images 128	Instances 993	P 0.801	R 0.706	0.777	0.45
Epoch 105/399	GPU_mem 2.07G	box_loss 0.0391	obj_loss 0.03629	cls_loss 0.002873	Instances 73	Size 416: 100% 28/28 [00:05<00:		
00, 5.19it/s]		Class all	Images 128	Instances 993	P 0.84	R 0.693	0.776	0.429
Epoch 106/399	GPU_mem 2.07G	box_loss 0.0398	obj_loss 0.03512	cls_loss 0.002705	Instances 154	Size 416: 100% 28/28 [00:05<00:		
00:01<00:00, 3.33it/s]		Class all	Images 128	Instances 993	P 0.866	R 0.679	0.778	0.437
Epoch 107/399	GPU_mem 2.07G	box_loss 0.03847	obj_loss 0.03462	cls_loss 0.002753	Instances 147	Size 416: 100% 28/28 [00:06<00:		
00:00<00:00, 4.53it/s]		Class all	Images 128	Instances 993	P 0.804	R 0.714	0.787	0.453
Epoch 108/399	GPU_mem 2.07G	box_loss 0.03896	obj_loss 0.03564	cls_loss 0.00341	Instances 142	Size 416: 100% 28/28 [00:05<00:		
00:00<00:00, 4.73it/s]		Class all	Images 128	Instances 993	P 0.839	R 0.651	0.774	0.434
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		

109/399 00, 5.15it/s]	2.07G	0.03713	0.03558	0.003284	121	416:	100%	28/28	[00:05<00:]
00:00<00:00, 4.71it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100%	4/4 [
Epoch 110/399 00, 5.22it/s]	GPU_mem 2.07G	box_loss 0.0387	obj_loss 0.03593	cls_loss 0.002603	Instances 163	Size 416:	100%	28/28	[00:05<00:]
00:00<00:00, 4.66it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100%	4/4 [
Epoch 111/399 00, 5.16it/s]	GPU_mem 2.07G	box_loss 0.0379	obj_loss 0.03575	cls_loss 0.002887	Instances 147	Size 416:	100%	28/28	[00:05<00:]
00:00<00:00, 4.63it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100%	4/4 [
Epoch 112/399 00, 3.95it/s]	GPU_mem 2.07G	box_loss 0.03732	obj_loss 0.03448	cls_loss 0.00275	Instances 106	Size 416:	100%	28/28	[00:07<00:]
00:00<00:00, 4.67it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100%	4/4 [
Epoch 113/399 00, 5.24it/s]	GPU_mem 2.07G	box_loss 0.03698	obj_loss 0.03488	cls_loss 0.002519	Instances 116	Size 416:	100%	28/28	[00:05<00:]
00:00<00:00, 4.54it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100%	4/4 [
Epoch 114/399 00, 5.06it/s]	GPU_mem 2.07G	box_loss 0.03767	obj_loss 0.03505	cls_loss 0.002469	Instances 158	Size 416:	100%	28/28	[00:05<00:]
00:00<00:00, 4.67it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100%	4/4 [
Epoch 115/399 00, 5.25it/s]	GPU_mem 2.07G	box_loss 0.03868	obj_loss 0.03577	cls_loss 0.002822	Instances 239	Size 416:	100%	28/28	[00:05<00:]
00:00<00:00, 4.20it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100%	4/4 [
Epoch 116/399 00, 5.09it/s]	GPU_mem 2.07G	box_loss 0.03681	obj_loss 0.03576	cls_loss 0.002559	Instances 91	Size 416:	100%	28/28	[00:05<00:]
00:00<00:00, 4.82it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100%	4/4 [
Epoch 117/399 00, 5.23it/s]	GPU_mem 2.07G	box_loss 0.03774	obj_loss 0.03383	cls_loss 0.002919	Instances 120	Size 416:	100%	28/28	[00:05<00:]
00:00<00:00, 4.47it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100%	4/4 [
Epoch 118/399 00, 5.38it/s]	GPU_mem 2.07G	box_loss 0.03852	obj_loss 0.03242	cls_loss 0.002821	Instances 120	Size 416:	100%	28/28	[00:05<00:]
00:00<00:00, 4.68it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100%	4/4 [
Epoch 119/399 00, 5.24it/s]	GPU_mem 2.07G	box_loss 0.03686	obj_loss 0.03462	cls_loss 0.002578	Instances 118	Size 416:	100%	28/28	[00:05<00:]
00:00<00:00, 4.56it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100%	4/4 [
Epoch 120/399 00, 5.13it/s]	GPU_mem 2.07G	box_loss 0.0385	obj_loss 0.03608	cls_loss 0.002739	Instances 150	Size 416:	100%	28/28	[00:05<00:]
00:00<00:00, 4.76it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100%	4/4 [

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
121/399 00, 5.16it/s]	2.07G	0.03689	0.03476	0.002589	165	416: 100% 28/28 [00:05<00:
00:00<00:00, 4.73it/s]	Class all	Images	Instances	P	R	mAP50 mAP50-95: 100% 4/4 [
122/399 00, 5.21it/s]	2.07G	0.03725	0.03331	0.002444	104	416: 100% 28/28 [00:05<00:
00:00<00:00, 4.66it/s]	Class all	Images	Instances	P	R	mAP50 mAP50-95: 100% 4/4 [
123/399 00, 5.19it/s]	2.07G	0.0371	0.03447	0.00265	139	416: 100% 28/28 [00:05<00:
00:00<00:00, 4.67it/s]	Class all	Images	Instances	P	R	mAP50 mAP50-95: 100% 4/4 [
124/399 00, 5.23it/s]	2.07G	0.03653	0.03379	0.002381	118	416: 100% 28/28 [00:05<00:
00:00<00:00, 4.56it/s]	Class all	Images	Instances	P	R	mAP50 mAP50-95: 100% 4/4 [
125/399 00, 5.26it/s]	2.07G	0.03603	0.03361	0.002261	89	416: 100% 28/28 [00:05<00:
00:00<00:00, 4.66it/s]	Class all	Images	Instances	P	R	mAP50 mAP50-95: 100% 4/4 [
126/399 00, 5.25it/s]	2.07G	0.03673	0.034	0.002161	191	416: 100% 28/28 [00:05<00:
00:00<00:00, 4.71it/s]	Class all	Images	Instances	P	R	mAP50 mAP50-95: 100% 4/4 [
127/399 00, 5.29it/s]	2.07G	0.03678	0.03145	0.002283	147	416: 100% 28/28 [00:05<00:
00:00<00:00, 4.73it/s]	Class all	Images	Instances	P	R	mAP50 mAP50-95: 100% 4/4 [
128/399 00, 5.26it/s]	2.07G	0.03665	0.03326	0.002448	143	416: 100% 28/28 [00:05<00:
00:00<00:00, 4.65it/s]	Class all	Images	Instances	P	R	mAP50 mAP50-95: 100% 4/4 [
129/399 00, 5.18it/s]	2.07G	0.03735	0.0348	0.002752	123	416: 100% 28/28 [00:05<00:
00:00<00:00, 4.48it/s]	Class all	Images	Instances	P	R	mAP50 mAP50-95: 100% 4/4 [
130/399 00, 5.23it/s]	2.07G	0.0372	0.03481	0.002379	190	416: 100% 28/28 [00:05<00:
00:00<00:00, 4.60it/s]	Class all	Images	Instances	P	R	mAP50 mAP50-95: 100% 4/4 [
131/399 00, 5.13it/s]	2.07G	0.03687	0.03439	0.002172	167	416: 100% 28/28 [00:05<00:
00:00<00:00, 4.71it/s]	Class all	Images	Instances	P	R	mAP50 mAP50-95: 100% 4/4 [
132/399 00, 5.10it/s]	2.07G	0.03772	0.03488	0.002439	134	416: 100% 28/28 [00:05<00:
00:00<00:00, 4.66it/s]	Class all	Images	Instances	P	R	mAP50 mAP50-95: 100% 4/4 [

Epoch 133/399 00, 5.19it/s]	GPU_mem 2.07G	box_loss 0.03678	obj_loss 0.03475	cls_loss 0.002442	Instances 123	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.73it/s] all	mAP50 mAP50-95: 100% 4/4 [0.768 0.445]
Epoch 134/399 00, 5.13it/s]	GPU_mem 2.07G	box_loss 0.03608	obj_loss 0.03312	cls_loss 0.002737	Instances 157	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.79it/s] all	mAP50 mAP50-95: 100% 4/4 [0.772 0.45]
Epoch 135/399 00, 5.08it/s]	GPU_mem 2.07G	box_loss 0.03695	obj_loss 0.03587	cls_loss 0.002361	Instances 112	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.74it/s] all	mAP50 mAP50-95: 100% 4/4 [0.778 0.457]
Epoch 136/399 00, 3.91it/s]	GPU_mem 2.07G	box_loss 0.03657	obj_loss 0.03391	cls_loss 0.002295	Instances 175	Size 416: 100% 28/28 [00:07<00: 00:00<00:00, 4.56it/s] all	mAP50 mAP50-95: 100% 4/4 [0.782 0.456]
Epoch 137/399 00, 5.22it/s]	GPU_mem 2.07G	box_loss 0.03539	obj_loss 0.03452	cls_loss 0.002045	Instances 138	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.70it/s] all	mAP50 mAP50-95: 100% 4/4 [0.767 0.45]
Epoch 138/399 00, 5.12it/s]	GPU_mem 2.07G	box_loss 0.03648	obj_loss 0.03528	cls_loss 0.002083	Instances 148	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.57it/s] all	mAP50 mAP50-95: 100% 4/4 [0.779 0.446]
Epoch 139/399 00, 5.18it/s]	GPU_mem 2.07G	box_loss 0.0354	obj_loss 0.03354	cls_loss 0.002459	Instances 176	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.78it/s] all	mAP50 mAP50-95: 100% 4/4 [0.788 0.454]
Epoch 140/399 00, 5.22it/s]	GPU_mem 2.07G	box_loss 0.0365	obj_loss 0.03324	cls_loss 0.002237	Instances 157	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.84it/s] all	mAP50 mAP50-95: 100% 4/4 [0.791 0.448]
Epoch 141/399 00, 5.15it/s]	GPU_mem 2.07G	box_loss 0.036	obj_loss 0.03566	cls_loss 0.001972	Instances 240	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.12it/s] all	mAP50 mAP50-95: 100% 4/4 [0.796 0.452]
Epoch 142/399 00, 4.09it/s]	GPU_mem 2.07G	box_loss 0.03682	obj_loss 0.03272	cls_loss 0.002136	Instances 138	Size 416: 100% 28/28 [00:06<00: 00:00<00:00, 4.66it/s] all	mAP50 mAP50-95: 100% 4/4 [0.78 0.45]
Epoch 143/399 00, 5.23it/s]	GPU_mem 2.07G	box_loss 0.03546	obj_loss 0.03229	cls_loss 0.002085	Instances 110	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.58it/s] all	mAP50 mAP50-95: 100% 4/4 [0.776 0.456]
Epoch 144/399 00, 5.19it/s]	GPU_mem 2.07G	box_loss 0.03584	obj_loss 0.03201	cls_loss 0.002387	Instances 142	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.60it/s] all	mAP50 mAP50-95: 100% 4/4 [0.77 0.457]

		all	128	993	0.805	0.722	0.785	0.458
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
145/399	2.07G	0.03606	0.03394	0.002262	109	416:	100%	28/28 [00:05<00:
00, 5.16it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
00:00<00:00,	4.65it/s]	all	128	993	0.778	0.728	0.772	0.454
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
146/399	2.07G	0.03583	0.03456	0.00199	165	416:	100%	28/28 [00:05<00:
00, 5.11it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
00:00<00:00,	4.79it/s]	all	128	993	0.752	0.74	0.769	0.447
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
147/399	2.07G	0.03551	0.03552	0.002483	118	416:	100%	28/28 [00:05<00:
00, 5.08it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
00:00<00:00,	4.61it/s]	all	128	993	0.801	0.708	0.758	0.443
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
148/399	2.07G	0.03488	0.03179	0.002141	145	416:	100%	28/28 [00:05<00:
00, 5.30it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
00:00<00:00,	4.51it/s]	all	128	993	0.832	0.668	0.751	0.452
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
149/399	2.07G	0.03475	0.03281	0.002621	94	416:	100%	28/28 [00:05<00:
00, 5.16it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
00:00<00:00,	4.77it/s]	all	128	993	0.81	0.729	0.783	0.457
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
150/399	2.07G	0.03606	0.03473	0.002194	209	416:	100%	28/28 [00:05<00:
00, 5.17it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
00:00<00:00,	4.39it/s]	all	128	993	0.819	0.72	0.778	0.447
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
151/399	2.07G	0.0356	0.03335	0.002023	120	416:	100%	28/28 [00:05<00:
00, 5.25it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
00:00<00:00,	4.74it/s]	all	128	993	0.851	0.721	0.781	0.458
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
152/399	2.07G	0.03554	0.03345	0.002285	262	416:	100%	28/28 [00:05<00:
00, 5.15it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
00:00<00:00,	4.75it/s]	all	128	993	0.849	0.698	0.773	0.449
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
153/399	2.07G	0.0366	0.03422	0.002163	169	416:	100%	28/28 [00:05<00:
00, 5.06it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
00:00<00:00,	4.76it/s]	all	128	993	0.805	0.71	0.771	0.465
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
154/399	2.07G	0.03455	0.03187	0.002106	78	416:	100%	28/28 [00:05<00:
00, 5.24it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
00:00<00:00,	4.76it/s]	all	128	993	0.809	0.732	0.772	0.457
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
155/399	2.07G	0.03503	0.03271	0.001853	167	416:	100%	28/28 [00:05<00:
00, 5.21it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
00:00<00:00,	4.72it/s]	all	128	993	0.815	0.731	0.778	0.465
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size		
156/399	2.07G	0.03466	0.03345	0.002204	114	416:	100%	28/28 [00:05<00:
00, 5.18it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [

00:00<00:00,	Class all	4.62it/s]	Images 128	Instances 993	P 0.822	R 0.74	mAP50 0.786	mAP50-95: 100% 4/4 [
00, 5.21it/s]	Epoch 169/399	GPU_mem 2.07G	box_loss 0.03425	obj_loss 0.03137	cls_loss 0.001857	Instances 178	Size 416: 100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.58it/s]	Images 128	Instances 993	P 0.844	R 0.702	mAP50 0.788	mAP50-95: 100% 4/4 [
00, 5.21it/s]	Epoch 170/399	GPU_mem 2.07G	box_loss 0.03386	obj_loss 0.0316	cls_loss 0.002072	Instances 145	Size 416: 100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.51it/s]	Images 128	Instances 993	P 0.795	R 0.749	mAP50 0.791	mAP50-95: 100% 4/4 [
00, 3.87it/s]	Epoch 171/399	GPU_mem 2.07G	box_loss 0.03347	obj_loss 0.03128	cls_loss 0.001923	Instances 115	Size 416: 100% 28/28 [00:07<00:	
00:00<00:00,	Class all	4.87it/s]	Images 128	Instances 993	P 0.842	R 0.725	mAP50 0.79	mAP50-95: 100% 4/4 [
00, 5.04it/s]	Epoch 172/399	GPU_mem 2.07G	box_loss 0.03423	obj_loss 0.03321	cls_loss 0.001802	Instances 196	Size 416: 100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.90it/s]	Images 128	Instances 993	P 0.84	R 0.73	mAP50 0.792	mAP50-95: 100% 4/4 [
00, 5.23it/s]	Epoch 173/399	GPU_mem 2.07G	box_loss 0.03456	obj_loss 0.03313	cls_loss 0.001641	Instances 108	Size 416: 100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.85it/s]	Images 128	Instances 993	P 0.813	R 0.743	mAP50 0.787	mAP50-95: 100% 4/4 [
00, 5.18it/s]	Epoch 174/399	GPU_mem 2.07G	box_loss 0.03319	obj_loss 0.03204	cls_loss 0.001883	Instances 147	Size 416: 100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.78it/s]	Images 128	Instances 993	P 0.809	R 0.727	mAP50 0.77	mAP50-95: 100% 4/4 [
00, 5.14it/s]	Epoch 175/399	GPU_mem 2.07G	box_loss 0.03356	obj_loss 0.03251	cls_loss 0.001745	Instances 193	Size 416: 100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.73it/s]	Images 128	Instances 993	P 0.835	R 0.712	mAP50 0.776	mAP50-95: 100% 4/4 [
00, 5.03it/s]	Epoch 176/399	GPU_mem 2.07G	box_loss 0.03421	obj_loss 0.03421	cls_loss 0.001972	Instances 157	Size 416: 100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.79it/s]	Images 128	Instances 993	P 0.863	R 0.703	mAP50 0.779	mAP50-95: 100% 4/4 [
00, 5.29it/s]	Epoch 177/399	GPU_mem 2.07G	box_loss 0.03293	obj_loss 0.03045	cls_loss 0.001742	Instances 157	Size 416: 100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.63it/s]	Images 128	Instances 993	P 0.834	R 0.698	mAP50 0.774	mAP50-95: 100% 4/4 [
00, 5.11it/s]	Epoch 178/399	GPU_mem 2.07G	box_loss 0.03402	obj_loss 0.03165	cls_loss 0.001847	Instances 160	Size 416: 100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.66it/s]	Images 128	Instances 993	P 0.842	R 0.708	mAP50 0.766	mAP50-95: 100% 4/4 [
00, 5.17it/s]	Epoch 179/399	GPU_mem 2.07G	box_loss 0.03414	obj_loss 0.031	cls_loss 0.001673	Instances 128	Size 416: 100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.75it/s]	Images 128	Instances 993	P 0.825	R 0.724	mAP50 0.766	mAP50-95: 100% 4/4 [
00, 5.18it/s]	Epoch 180/399	GPU_mem 2.07G	box_loss 0.0336	obj_loss 0.0325	cls_loss 0.001998	Instances 197	Size 416: 100% 28/28 [00:05<00:	

00, 5.08it/s]		Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.68it/s]	all		128	993	0.855	0.714	0.769	0.458
Epoch 181/399	GPU_mem 2.07G	box_loss 0.03262	obj_loss 0.03001	cls_loss 0.00155	Instances 140		Size 416: 100% 28/28 [00:05<00:	
00, 5.22it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.63it/s]	all		128	993	0.828	0.737	0.781	0.475
Epoch 182/399	GPU_mem 2.07G	box_loss 0.03389	obj_loss 0.03417	cls_loss 0.001697	Instances 119		Size 416: 100% 28/28 [00:05<00:	
00, 4.97it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.64it/s]	all		128	993	0.832	0.727	0.775	0.47
Epoch 183/399	GPU_mem 2.07G	box_loss 0.03376	obj_loss 0.03097	cls_loss 0.001785	Instances 110		Size 416: 100% 28/28 [00:05<00:	
00, 5.24it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.66it/s]	all		128	993	0.82	0.754	0.783	0.458
Epoch 184/399	GPU_mem 2.07G	box_loss 0.0337	obj_loss 0.03181	cls_loss 0.001714	Instances 231		Size 416: 100% 28/28 [00:05<00:	
00, 5.10it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.71it/s]	all		128	993	0.804	0.721	0.775	0.462
Epoch 185/399	GPU_mem 2.07G	box_loss 0.03285	obj_loss 0.03143	cls_loss 0.001814	Instances 151		Size 416: 100% 28/28 [00:05<00:	
00, 5.17it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.53it/s]	all		128	993	0.801	0.747	0.786	0.47
Epoch 186/399	GPU_mem 2.07G	box_loss 0.03343	obj_loss 0.0321	cls_loss 0.001603	Instances 85		Size 416: 100% 28/28 [00:05<00:	
00, 5.10it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.37it/s]	all		128	993	0.837	0.718	0.789	0.471
Epoch 187/399	GPU_mem 2.07G	box_loss 0.03248	obj_loss 0.03019	cls_loss 0.001573	Instances 124		Size 416: 100% 28/28 [00:05<00:	
00, 5.22it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.66it/s]	all		128	993	0.829	0.723	0.785	0.463
Epoch 188/399	GPU_mem 2.07G	box_loss 0.03379	obj_loss 0.03308	cls_loss 0.001565	Instances 120		Size 416: 100% 28/28 [00:05<00:	
00, 5.09it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.71it/s]	all		128	993	0.822	0.717	0.79	0.462
Epoch 189/399	GPU_mem 2.07G	box_loss 0.03334	obj_loss 0.03284	cls_loss 0.001437	Instances 185		Size 416: 100% 28/28 [00:05<00:	
00, 4.99it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.73it/s]	all		128	993	0.812	0.752	0.794	0.463
Epoch 190/399	GPU_mem 2.07G	box_loss 0.03335	obj_loss 0.03131	cls_loss 0.001649	Instances 136		Size 416: 100% 28/28 [00:05<00:	
00, 5.13it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.70it/s]	all		128	993	0.824	0.708	0.78	0.464
Epoch 191/399	GPU_mem 2.07G	box_loss 0.03333	obj_loss 0.03159	cls_loss 0.001567	Instances 104		Size 416: 100% 28/28 [00:05<00:	
00, 5.20it/s]	Class	Images	Instances	P	R	mAP50	mAP50-95: 100% 4/4 [
00:00<00:00, 4.63it/s]	all		128	993	0.812	0.72	0.785	0.462
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances		Size	

192/399 00, 5.32it/s]	2.07G	0.03214	0.03046	0.001885	134	416:	100%	28/28	[00:05<00:]
00:00<00:00, Epoch 193/399 00, 5.08it/s]	Class GPU_mem 4.57it/s all	Images 2.07G	Instances box_loss 0.03332	P obj_loss 0.03161	R cls_loss 0.001591	mAP50 Instances 124	mAP50-95: 100%	4/4	[
00:00<00:00, Epoch 194/399 00, 5.04it/s]	Class GPU_mem 4.76it/s all	Images 2.07G	Instances box_loss 0.03281	P obj_loss 0.03294	R cls_loss 0.001636	mAP50 Instances 140	mAP50-95: 100%	4/4	[
00:01<00:00, Epoch 195/399 00, 4.34it/s]	Class GPU_mem 3.55it/s all	Images 2.07G	Instances box_loss 0.03377	P obj_loss 0.03089	R cls_loss 0.001516	mAP50 Instances 92	mAP50-95: 100%	4/4	[
00:00<00:00, Epoch 196/399 00, 5.13it/s]	Class GPU_mem 4.86it/s all	Images 2.07G	Instances box_loss 0.0324	P obj_loss 0.03145	R cls_loss 0.001729	mAP50 Instances 203	mAP50-95: 100%	4/4	[
00:00<00:00, Epoch 197/399 00, 5.23it/s]	Class GPU_mem 4.75it/s all	Images 2.07G	Instances box_loss 0.0328	P obj_loss 0.03184	R cls_loss 0.001925	mAP50 Instances 105	mAP50-95: 100%	4/4	[
00:00<00:00, Epoch 198/399 00, 5.26it/s]	Class GPU_mem 4.77it/s all	Images 2.07G	Instances box_loss 0.03282	P obj_loss 0.02993	R cls_loss 0.002147	mAP50 Instances 152	mAP50-95: 100%	4/4	[
00:01<00:00, Epoch 199/399 00, 5.18it/s]	Class GPU_mem 3.74it/s all	Images 2.07G	Instances box_loss 0.03149	P obj_loss 0.03104	R cls_loss 0.00177	mAP50 Instances 134	mAP50-95: 100%	4/4	[
00:01<00:00, Epoch 200/399 00, 4.10it/s]	Class GPU_mem 3.45it/s all	Images 2.07G	Instances box_loss 0.03251	P obj_loss 0.03237	R cls_loss 0.001452	mAP50 Instances 146	mAP50-95: 100%	4/4	[
00:00<00:00, Epoch 201/399 00, 5.25it/s]	Class GPU_mem 4.81it/s all	Images 2.07G	Instances box_loss 0.03256	P obj_loss 0.02993	R cls_loss 0.0013	mAP50 Instances 239	mAP50-95: 100%	4/4	[
00:00<00:00, Epoch 202/399 00, 5.02it/s]	Class GPU_mem 4.94it/s all	Images 2.07G	Instances box_loss 0.03256	P obj_loss 0.0318	R cls_loss 0.001514	mAP50 Instances 227	mAP50-95: 100%	4/4	[
00:00<00:00, Epoch 203/399 00, 5.22it/s]	Class GPU_mem 4.76it/s all	Images 2.07G	Instances box_loss 0.03222	P obj_loss 0.03066	R cls_loss 0.001636	mAP50 Instances 103	mAP50-95: 100%	4/4	[

Epoch 204/399 00, 5.14it/s]	GPU_mem 2.07G	box_loss 0.03131	obj_loss 0.03004	cls_loss 0.001346	Instances 139	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.62it/s] all	mAP50 mAP50-95: 100% 4/4 [0.775 0.464]
Epoch 205/399 00, 5.18it/s]	GPU_mem 2.07G	box_loss 0.03317	obj_loss 0.03064	cls_loss 0.001753	Instances 180	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.56it/s] all	mAP50 mAP50-95: 100% 4/4 [0.771 0.459]
Epoch 206/399 00, 5.12it/s]	GPU_mem 2.07G	box_loss 0.03269	obj_loss 0.03014	cls_loss 0.001744	Instances 222	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.58it/s] all	mAP50 mAP50-95: 100% 4/4 [0.782 0.46]
Epoch 207/399 00, 5.09it/s]	GPU_mem 2.07G	box_loss 0.03171	obj_loss 0.03166	cls_loss 0.001503	Instances 190	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.80it/s] all	mAP50 mAP50-95: 100% 4/4 [0.791 0.469]
Epoch 208/399 00, 5.10it/s]	GPU_mem 2.07G	box_loss 0.03195	obj_loss 0.03165	cls_loss 0.001394	Instances 157	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.75it/s] all	mAP50 mAP50-95: 100% 4/4 [0.786 0.473]
Epoch 209/399 00, 5.14it/s]	GPU_mem 2.07G	box_loss 0.03263	obj_loss 0.03084	cls_loss 0.001543	Instances 195	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.59it/s] all	mAP50 mAP50-95: 100% 4/4 [0.778 0.465]
Epoch 210/399 00, 5.09it/s]	GPU_mem 2.07G	box_loss 0.03279	obj_loss 0.03152	cls_loss 0.001594	Instances 181	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.78it/s] all	mAP50 mAP50-95: 100% 4/4 [0.778 0.46]
Epoch 211/399 00, 5.14it/s]	GPU_mem 2.07G	box_loss 0.03266	obj_loss 0.03153	cls_loss 0.001746	Instances 132	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.68it/s] all	mAP50 mAP50-95: 100% 4/4 [0.78 0.463]
Epoch 212/399 00, 5.22it/s]	GPU_mem 2.07G	box_loss 0.03132	obj_loss 0.03009	cls_loss 0.001488	Instances 140	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.51it/s] all	mAP50 mAP50-95: 100% 4/4 [0.777 0.461]
Epoch 213/399 00, 5.27it/s]	GPU_mem 2.07G	box_loss 0.03143	obj_loss 0.02845	cls_loss 0.001509	Instances 118	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.79it/s] all	mAP50 mAP50-95: 100% 4/4 [0.772 0.465]
Epoch 214/399 00, 5.17it/s]	GPU_mem 2.07G	box_loss 0.03166	obj_loss 0.02946	cls_loss 0.001359	Instances 101	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.71it/s] all	mAP50 mAP50-95: 100% 4/4 [0.774 0.468]
Epoch 215/399 00, 5.09it/s]	GPU_mem 2.07G	box_loss 0.03118	obj_loss 0.03051	cls_loss 0.001387	Instances 160	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.74it/s] all	mAP50 mAP50-95: 100% 4/4 [0.789 0.476]

Epoch 216/399 00, 5.20it/s]	GPU_mem 2.07G	box_loss 0.03139	obj_loss 0.03092	cls_loss 0.001583	Instances 176	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.62it/s] all	mAP50 mAP50-95: 100% 4/4 [0.791 0.475]
Epoch 217/399 00, 5.23it/s]	GPU_mem 2.07G	box_loss 0.03081	obj_loss 0.02945	cls_loss 0.001512	Instances 166	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.79it/s] all	mAP50 mAP50-95: 100% 4/4 [0.781 0.464]
Epoch 218/399 00, 5.12it/s]	GPU_mem 2.07G	box_loss 0.0309	obj_loss 0.03083	cls_loss 0.001387	Instances 205	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.61it/s] all	mAP50 mAP50-95: 100% 4/4 [0.786 0.47]
Epoch 219/399 00, 5.31it/s]	GPU_mem 2.07G	box_loss 0.03039	obj_loss 0.02911	cls_loss 0.001589	Instances 138	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.67it/s] all	mAP50 mAP50-95: 100% 4/4 [0.79 0.471]
Epoch 220/399 00, 5.18it/s]	GPU_mem 2.07G	box_loss 0.03194	obj_loss 0.0294	cls_loss 0.001416	Instances 122	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.61it/s] all	mAP50 mAP50-95: 100% 4/4 [0.784 0.47]
Epoch 221/399 00, 5.11it/s]	GPU_mem 2.07G	box_loss 0.03127	obj_loss 0.03031	cls_loss 0.001331	Instances 116	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.71it/s] all	mAP50 mAP50-95: 100% 4/4 [0.788 0.472]
Epoch 222/399 00, 5.21it/s]	GPU_mem 2.07G	box_loss 0.03151	obj_loss 0.03041	cls_loss 0.00152	Instances 117	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.71it/s] all	mAP50 mAP50-95: 100% 4/4 [0.783 0.46]
Epoch 223/399 00, 5.26it/s]	GPU_mem 2.07G	box_loss 0.03154	obj_loss 0.02827	cls_loss 0.001512	Instances 117	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.73it/s] all	mAP50 mAP50-95: 100% 4/4 [0.786 0.464]
Epoch 224/399 00, 4.61it/s]	GPU_mem 2.07G	box_loss 0.03088	obj_loss 0.02865	cls_loss 0.00131	Instances 119	Size 416: 100% 28/28 [00:06<00: 00:01<00:00, 3.24it/s] all	mAP50 mAP50-95: 100% 4/4 [0.788 0.462]
Epoch 225/399 00, 4.81it/s]	GPU_mem 2.07G	box_loss 0.0309	obj_loss 0.02972	cls_loss 0.001396	Instances 109	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.85it/s] all	mAP50 mAP50-95: 100% 4/4 [0.78 0.468]
Epoch 226/399 00, 4.98it/s]	GPU_mem 2.07G	box_loss 0.03158	obj_loss 0.03111	cls_loss 0.001468	Instances 93	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.87it/s] all	mAP50 mAP50-95: 100% 4/4 [0.79 0.463]
Epoch 227/399 00, 5.14it/s]	GPU_mem 2.07G	box_loss 0.03074	obj_loss 0.02914	cls_loss 0.001209	Instances 99	Size 416: 100% 28/28 [00:05<00: 00:00<00:00, 4.88it/s] all	mAP50 mAP50-95: 100% 4/4 [0.79 0.463]

		all	128	993	0.858	0.723	0.79	0.467
Epoch 228/399 00, 5.19it/s]	GPU_mem 2.07G	box_loss 0.03091	obj_loss 0.02952	cls_loss 0.00133	Instances 175	Size 416: 100% 28/28 [00:05<00:		
00:00<00:00, 4.65it/s]	Class all	Images 128	Instances 993	P 0.865	R 0.718	mAP50 0.796	mAP50-95: 100% 4/4 [0.467
Epoch 229/399 00, 5.24it/s]	GPU_mem 2.07G	box_loss 0.03078	obj_loss 0.02893	cls_loss 0.001462	Instances 161	Size 416: 100% 28/28 [00:05<00:		
00:01<00:00, 3.85it/s]	Class all	Images 128	Instances 993	P 0.857	R 0.729	mAP50 0.792	mAP50-95: 100% 4/4 [0.476
Epoch 230/399 00, 4.21it/s]	GPU_mem 2.07G	box_loss 0.03068	obj_loss 0.02809	cls_loss 0.001456	Instances 130	Size 416: 100% 28/28 [00:06<00:		
00:00<00:00, 4.83it/s]	Class all	Images 128	Instances 993	P 0.848	R 0.739	mAP50 0.801	mAP50-95: 100% 4/4 [0.472
Epoch 231/399 00, 4.96it/s]	GPU_mem 2.07G	box_loss 0.03076	obj_loss 0.03136	cls_loss 0.00129	Instances 177	Size 416: 100% 28/28 [00:05<00:		
00:00<00:00, 4.87it/s]	Class all	Images 128	Instances 993	P 0.81	R 0.741	mAP50 0.795	mAP50-95: 100% 4/4 [0.466
Epoch 232/399 00, 5.20it/s]	GPU_mem 2.07G	box_loss 0.03099	obj_loss 0.02965	cls_loss 0.001283	Instances 146	Size 416: 100% 28/28 [00:05<00:		
00:00<00:00, 4.35it/s]	Class all	Images 128	Instances 993	P 0.835	R 0.726	mAP50 0.791	mAP50-95: 100% 4/4 [0.469
Epoch 233/399 00, 5.17it/s]	GPU_mem 2.07G	box_loss 0.03015	obj_loss 0.02999	cls_loss 0.001274	Instances 123	Size 416: 100% 28/28 [00:05<00:		
00:00<00:00, 4.75it/s]	Class all	Images 128	Instances 993	P 0.835	R 0.731	mAP50 0.783	mAP50-95: 100% 4/4 [0.469
Epoch 234/399 00, 5.17it/s]	GPU_mem 2.07G	box_loss 0.03032	obj_loss 0.03088	cls_loss 0.001295	Instances 153	Size 416: 100% 28/28 [00:05<00:		
00:00<00:00, 4.19it/s]	Class all	Images 128	Instances 993	P 0.812	R 0.732	mAP50 0.777	mAP50-95: 100% 4/4 [0.461
Epoch 235/399 00, 5.18it/s]	GPU_mem 2.07G	box_loss 0.03134	obj_loss 0.03063	cls_loss 0.001338	Instances 106	Size 416: 100% 28/28 [00:05<00:		
00:00<00:00, 4.46it/s]	Class all	Images 128	Instances 993	P 0.846	R 0.718	mAP50 0.786	mAP50-95: 100% 4/4 [0.463
Epoch 236/399 00, 5.16it/s]	GPU_mem 2.07G	box_loss 0.03155	obj_loss 0.02958	cls_loss 0.001764	Instances 139	Size 416: 100% 28/28 [00:05<00:		
00:00<00:00, 4.70it/s]	Class all	Images 128	Instances 993	P 0.824	R 0.748	mAP50 0.78	mAP50-95: 100% 4/4 [0.464
Epoch 237/399 00, 5.12it/s]	GPU_mem 2.07G	box_loss 0.0305	obj_loss 0.02995	cls_loss 0.001175	Instances 150	Size 416: 100% 28/28 [00:05<00:		
00:00<00:00, 4.68it/s]	Class all	Images 128	Instances 993	P 0.837	R 0.703	mAP50 0.772	mAP50-95: 100% 4/4 [0.459
Epoch 238/399 00, 5.12it/s]	GPU_mem 2.07G	box_loss 0.03156	obj_loss 0.03018	cls_loss 0.00114	Instances 151	Size 416: 100% 28/28 [00:05<00:		
00:00<00:00, 4.69it/s]	Class all	Images 128	Instances 993	P 0.851	R 0.709	mAP50 0.781	mAP50-95: 100% 4/4 [0.462
Epoch 239/399 00, 5.18it/s]	GPU_mem 2.07G	box_loss 0.02986	obj_loss 0.02924	cls_loss 0.001164	Instances 105	Size 416: 100% 28/28 [00:05<00:		
00:00<00:00, 4.69it/s]	Class all	Images 128	Instances 993	P 0.848	R 0.712	mAP50 0.78	mAP50-95: 100% 4/4 [0.463

00:00<00:00, 4.82it/s]		all	128	993	0.838	0.716	0.772	0.464
Epoch 240/399 5.14it/s]		GPU_mem 2.07G	box_loss 0.03014	obj_loss 0.0293	cls_loss 0.001432	Instances 198	Size 416:	100% 28/28 [00:05<00:
00:00<00:00, 4.77it/s]		Class all	Images 128	Instances 993	P 0.814	R 0.728	mAP50 0.775	mAP50-95: 100% 4/4 [
Epoch 241/399 5.18it/s]		GPU_mem 2.07G	box_loss 0.03064	obj_loss 0.02858	cls_loss 0.001351	Instances 141	Size 416:	100% 28/28 [00:05<00:
00:00<00:00, 4.71it/s]		Class all	Images 128	Instances 993	P 0.829	R 0.717	mAP50 0.769	mAP50-95: 100% 4/4 [
Epoch 242/399 5.32it/s]		GPU_mem 2.07G	box_loss 0.02954	obj_loss 0.02689	cls_loss 0.001357	Instances 90	Size 416:	100% 28/28 [00:05<00:
00:00<00:00, 4.79it/s]		Class all	Images 128	Instances 993	P 0.856	R 0.694	mAP50 0.774	mAP50-95: 100% 4/4 [
Epoch 243/399 5.01it/s]		GPU_mem 2.07G	box_loss 0.02977	obj_loss 0.02808	cls_loss 0.001349	Instances 125	Size 416:	100% 28/28 [00:05<00:
00:00<00:00, 4.79it/s]		Class all	Images 128	Instances 993	P 0.805	R 0.711	mAP50 0.767	mAP50-95: 100% 4/4 [
Epoch 244/399 5.15it/s]		GPU_mem 2.07G	box_loss 0.03058	obj_loss 0.03029	cls_loss 0.001373	Instances 170	Size 416:	100% 28/28 [00:05<00:
00:00<00:00, 4.74it/s]		Class all	Images 128	Instances 993	P 0.866	R 0.709	mAP50 0.776	mAP50-95: 100% 4/4 [
Epoch 245/399 5.25it/s]		GPU_mem 2.07G	box_loss 0.03018	obj_loss 0.02731	cls_loss 0.001257	Instances 157	Size 416:	100% 28/28 [00:05<00:
00:00<00:00, 4.66it/s]		Class all	Images 128	Instances 993	P 0.864	R 0.694	mAP50 0.775	mAP50-95: 100% 4/4 [
Epoch 246/399 5.18it/s]		GPU_mem 2.07G	box_loss 0.03023	obj_loss 0.02914	cls_loss 0.001216	Instances 171	Size 416:	100% 28/28 [00:05<00:
00:00<00:00, 4.60it/s]		Class all	Images 128	Instances 993	P 0.863	R 0.71	mAP50 0.777	mAP50-95: 100% 4/4 [
Epoch 247/399 5.16it/s]		GPU_mem 2.07G	box_loss 0.03005	obj_loss 0.02952	cls_loss 0.001298	Instances 107	Size 416:	100% 28/28 [00:05<00:
00:00<00:00, 4.84it/s]		Class all	Images 128	Instances 993	P 0.849	R 0.69	mAP50 0.776	mAP50-95: 100% 4/4 [
Epoch 248/399 5.18it/s]		GPU_mem 2.07G	box_loss 0.03	obj_loss 0.02823	cls_loss 0.001636	Instances 141	Size 416:	100% 28/28 [00:05<00:
00:00<00:00, 4.84it/s]		Class all	Images 128	Instances 993	P 0.842	R 0.699	mAP50 0.779	mAP50-95: 100% 4/4 [
Epoch 249/399 5.20it/s]		GPU_mem 2.07G	box_loss 0.02965	obj_loss 0.02943	cls_loss 0.001261	Instances 151	Size 416:	100% 28/28 [00:05<00:
00:00<00:00, 4.81it/s]		Class all	Images 128	Instances 993	P 0.84	R 0.725	mAP50 0.78	mAP50-95: 100% 4/4 [
Epoch 250/399 5.19it/s]		GPU_mem 2.07G	box_loss 0.02988	obj_loss 0.02882	cls_loss 0.001237	Instances 173	Size 416:	100% 28/28 [00:05<00:
00:00<00:00, 4.60it/s]		Class all	Images 128	Instances 993	P 0.881	R 0.71	mAP50 0.78	mAP50-95: 100% 4/4 [
Epoch 251/399 5.10it/s]		GPU_mem 2.07G	box_loss 0.02966	obj_loss 0.02872	cls_loss 0.001369	Instances 169	Size 416:	100% 28/28 [00:05<00:

00:00<00:00,	Class all	4.84it/s]	Images 128	Instances 993	P 0.835	R 0.739	mAP50 0.782	mAP50-95: 100% 4/4 [
Epoch 252/399 00, 5.24it/s]	GPU_mem 2.07G	box_loss 0.03007	obj_loss 0.02848	cls_loss 0.001293	Instances 151	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.82it/s]	Images 128	Instances 993	P 0.847	R 0.735	mAP50 0.783	mAP50-95: 100% 4/4 [
Epoch 253/399 00, 5.04it/s]	GPU_mem 2.07G	box_loss 0.03078	obj_loss 0.03021	cls_loss 0.00124	Instances 100	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.69it/s]	Images 128	Instances 993	P 0.843	R 0.719	mAP50 0.774	mAP50-95: 100% 4/4 [
Epoch 254/399 00, 5.29it/s]	GPU_mem 2.07G	box_loss 0.03051	obj_loss 0.02809	cls_loss 0.001102	Instances 115	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.75it/s]	Images 128	Instances 993	P 0.855	R 0.718	mAP50 0.779	mAP50-95: 100% 4/4 [
Epoch 255/399 00, 3.87it/s]	GPU_mem 2.07G	box_loss 0.03036	obj_loss 0.03011	cls_loss 0.001298	Instances 146	Size 416:	100% 28/28 [00:07<00:	
00:00<00:00,	Class all	4.07it/s]	Images 128	Instances 993	P 0.844	R 0.724	mAP50 0.784	mAP50-95: 100% 4/4 [
Epoch 256/399 00, 5.13it/s]	GPU_mem 2.07G	box_loss 0.03065	obj_loss 0.03066	cls_loss 0.001471	Instances 126	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.91it/s]	Images 128	Instances 993	P 0.801	R 0.728	mAP50 0.779	mAP50-95: 100% 4/4 [
Epoch 257/399 00, 5.20it/s]	GPU_mem 2.07G	box_loss 0.02965	obj_loss 0.02793	cls_loss 0.001255	Instances 103	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.84it/s]	Images 128	Instances 993	P 0.82	R 0.731	mAP50 0.774	mAP50-95: 100% 4/4 [
Epoch 258/399 00, 5.14it/s]	GPU_mem 2.07G	box_loss 0.02863	obj_loss 0.0277	cls_loss 0.00103	Instances 143	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.83it/s]	Images 128	Instances 993	P 0.821	R 0.724	mAP50 0.772	mAP50-95: 100% 4/4 [
Epoch 259/399 00, 4.27it/s]	GPU_mem 2.07G	box_loss 0.02942	obj_loss 0.02817	cls_loss 0.001086	Instances 166	Size 416:	100% 28/28 [00:06<00:	
00:01<00:00,	Class all	3.34it/s]	Images 128	Instances 993	P 0.821	R 0.737	mAP50 0.776	mAP50-95: 100% 4/4 [
Epoch 260/399 00, 5.12it/s]	GPU_mem 2.07G	box_loss 0.03019	obj_loss 0.02991	cls_loss 0.001212	Instances 110	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.74it/s]	Images 128	Instances 993	P 0.837	R 0.734	mAP50 0.789	mAP50-95: 100% 4/4 [
Epoch 261/399 00, 5.08it/s]	GPU_mem 2.07G	box_loss 0.02989	obj_loss 0.02901	cls_loss 0.001357	Instances 195	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.75it/s]	Images 128	Instances 993	P 0.831	R 0.746	mAP50 0.783	mAP50-95: 100% 4/4 [
Epoch 262/399 00, 5.20it/s]	GPU_mem 2.07G	box_loss 0.02943	obj_loss 0.02971	cls_loss 0.001151	Instances 158	Size 416:	100% 28/28 [00:05<00:	
00:00<00:00,	Class all	4.52it/s]	Images 128	Instances 993	P 0.841	R 0.723	mAP50 0.783	mAP50-95: 100% 4/4 [
Epoch 263/399	GPU_mem 2.07G	box_loss 0.02863	obj_loss 0.02751	cls_loss 0.001289	Instances 143	Size 416:	100% 28/28 [00:05<00:	

00, 5.40it/s]		Class all	Images 128	Instances 993	P 0.856	R 0.716	mAP50 0.78	mAP50-95: 100% 4/4 [
00:00<00:00, 4.72it/s]	Epoch 264/399	GPU_mem 2.07G	box_loss 0.02938	obj_loss 0.02985	cls_loss 0.001068	Instances 192	Size 416: 100% 28/28 [00:05<00:	
00, 5.07it/s]		Class all	Images 128	Instances 993	P 0.857	R 0.718	mAP50 0.79	mAP50-95: 100% 4/4 [
00:00<00:00, 4.89it/s]	Epoch 265/399	GPU_mem 2.07G	box_loss 0.02907	obj_loss 0.02819	cls_loss 0.001378	Instances 111	Size 416: 100% 28/28 [00:05<00:	
00, 5.22it/s]		Class all	Images 128	Instances 993	P 0.843	R 0.729	mAP50 0.791	mAP50-95: 100% 4/4 [
00:00<00:00, 4.77it/s]	Epoch 266/399	GPU_mem 2.07G	box_loss 0.02907	obj_loss 0.02908	cls_loss 0.001412	Instances 204	Size 416: 100% 28/28 [00:05<00:	
00, 5.12it/s]		Class all	Images 128	Instances 993	P 0.874	R 0.693	mAP50 0.787	mAP50-95: 100% 4/4 [
00:00<00:00, 4.62it/s]	Epoch 267/399	GPU_mem 2.07G	box_loss 0.03057	obj_loss 0.02958	cls_loss 0.00103	Instances 170	Size 416: 100% 28/28 [00:05<00:	
00, 5.07it/s]		Class all	Images 128	Instances 993	P 0.825	R 0.716	mAP50 0.774	mAP50-95: 100% 4/4 [
00:00<00:00, 4.72it/s]	Epoch 268/399	GPU_mem 2.07G	box_loss 0.02942	obj_loss 0.02792	cls_loss 0.001217	Instances 168	Size 416: 100% 28/28 [00:05<00:	
00, 5.20it/s]		Class all	Images 128	Instances 993	P 0.825	R 0.723	mAP50 0.777	mAP50-95: 100% 4/4 [
00:00<00:00, 4.86it/s]	Epoch 269/399	GPU_mem 2.07G	box_loss 0.02951	obj_loss 0.02877	cls_loss 0.001179	Instances 178	Size 416: 100% 28/28 [00:05<00:	
00, 5.24it/s]		Class all	Images 128	Instances 993	P 0.848	R 0.711	mAP50 0.793	mAP50-95: 100% 4/4 [
00:00<00:00, 4.15it/s]	Epoch 270/399	GPU_mem 2.07G	box_loss 0.02873	obj_loss 0.02931	cls_loss 0.0008756	Instances 225	Size 416: 100% 28/28 [00:05<00:	
00, 5.05it/s]		Class all	Images 128	Instances 993	P 0.796	R 0.756	mAP50 0.794	mAP50-95: 100% 4/4 [
00:00<00:00, 4.85it/s]	Epoch 271/399	GPU_mem 2.07G	box_loss 0.02894	obj_loss 0.02899	cls_loss 0.001071	Instances 173	Size 416: 100% 28/28 [00:05<00:	
00, 5.06it/s]		Class all	Images 128	Instances 993	P 0.84	R 0.729	mAP50 0.795	mAP50-95: 100% 4/4 [
00:00<00:00, 4.83it/s]	Epoch 272/399	GPU_mem 2.07G	box_loss 0.02901	obj_loss 0.02816	cls_loss 0.001224	Instances 168	Size 416: 100% 28/28 [00:05<00:	
00, 5.10it/s]		Class all	Images 128	Instances 993	P 0.822	R 0.734	mAP50 0.786	mAP50-95: 100% 4/4 [
00:00<00:00, 4.85it/s]	Epoch 273/399	GPU_mem 2.07G	box_loss 0.02905	obj_loss 0.02812	cls_loss 0.001156	Instances 107	Size 416: 100% 28/28 [00:05<00:	
00, 5.13it/s]		Class all	Images 128	Instances 993	P 0.822	R 0.743	mAP50 0.784	mAP50-95: 100% 4/4 [
00:00<00:00, 4.84it/s]	Epoch 274/399	GPU_mem 2.07G	box_loss 0.02978	obj_loss 0.02815	cls_loss 0.001496	Instances 106	Size 416: 100% 28/28 [00:05<00:	
00, 5.30it/s]		Class all	Images 128	Instances 993	P 0.865	R 0.712	mAP50 0.784	mAP50-95: 100% 4/4 [
	Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	

275/399 00, 5.22it/s]	2.07G	0.02864	0.02703	0.001142	176	416:	100%	28/28 [00:05<00:
00:00<00:00, 4.57it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
Epoch 276/399 00, 5.16it/s]	GPU_mem 2.07G	box_loss 0.02889	obj_loss 0.02795	cls_loss 0.0009889	Instances 189	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.29it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
Epoch 277/399 00, 5.10it/s]	GPU_mem 2.07G	box_loss 0.02926	obj_loss 0.02794	cls_loss 0.001263	Instances 137	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.82it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
Epoch 278/399 00, 5.06it/s]	GPU_mem 2.07G	box_loss 0.02906	obj_loss 0.02995	cls_loss 0.001215	Instances 155	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.53it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
Epoch 279/399 00, 5.02it/s]	GPU_mem 2.07G	box_loss 0.02875	obj_loss 0.02937	cls_loss 0.001181	Instances 219	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.69it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
Epoch 280/399 00, 5.11it/s]	GPU_mem 2.07G	box_loss 0.02888	obj_loss 0.02932	cls_loss 0.0008666	Instances 176	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.47it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
Epoch 281/399 00, 5.13it/s]	GPU_mem 2.07G	box_loss 0.02831	obj_loss 0.02866	cls_loss 0.000874	Instances 147	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.84it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
Epoch 282/399 00, 5.25it/s]	GPU_mem 2.07G	box_loss 0.02912	obj_loss 0.02812	cls_loss 0.001166	Instances 142	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.69it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
Epoch 283/399 00, 5.15it/s]	GPU_mem 2.07G	box_loss 0.02788	obj_loss 0.02685	cls_loss 0.001342	Instances 144	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.93it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
Epoch 284/399 00, 5.19it/s]	GPU_mem 2.07G	box_loss 0.02819	obj_loss 0.02677	cls_loss 0.001044	Instances 137	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.75it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
Epoch 285/399 00, 3.82it/s]	GPU_mem 2.07G	box_loss 0.02913	obj_loss 0.02849	cls_loss 0.001269	Instances 116	Size 416:	100%	28/28 [00:07<00:
00:00<00:00, 4.66it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [
Epoch 286/399 00, 5.27it/s]	GPU_mem 2.07G	box_loss 0.0289	obj_loss 0.02717	cls_loss 0.0009714	Instances 168	Size 416:	100%	28/28 [00:05<00:
00:00<00:00, 4.59it/s]	Class all	Images	Instances	P	R	mAP50	mAP50-95:	100% 4/4 [

Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	mAP50	mAP50-95:	100% 4/4 [
287/399 00, 5.20it/s]	2.07G	0.02837	0.02693	0.0009378	151	416:	100%	28/28	[00:05<00:
00:00<00:00, 4.86it/s]	Class all	Images	Instances	P	R				
		128	993	0.849	0.731	0.786	0.466		
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	mAP50	mAP50-95:	100% 4/4 [
288/399 00, 5.11it/s]	2.07G	0.02849	0.02804	0.0009775	130	416:	100%	28/28	[00:05<00:
00:01<00:00, 3.38it/s]	Class all	Images	Instances	P	R				
		128	993	0.869	0.726	0.787	0.47		
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	mAP50	mAP50-95:	100% 4/4 [
289/399 00, 4.46it/s]	2.07G	0.02936	0.02761	0.001281	171	416:	100%	28/28	[00:06<00:
00:00<00:00, 4.84it/s]	Class all	Images	Instances	P	R				
		128	993	0.837	0.73	0.786	0.469		
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	mAP50	mAP50-95:	100% 4/4 [
290/399 00, 5.22it/s]	2.07G	0.02877	0.02791	0.0009865	133	416:	100%	28/28	[00:05<00:
00:00<00:00, 4.63it/s]	Class all	Images	Instances	P	R				
		128	993	0.86	0.725	0.782	0.469		
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	mAP50	mAP50-95:	100% 4/4 [
291/399 00, 5.14it/s]	2.07G	0.02853	0.02726	0.00117	128	416:	100%	28/28	[00:05<00:
00:00<00:00, 4.77it/s]	Class all	Images	Instances	P	R				
		128	993	0.876	0.715	0.79	0.471		
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	mAP50	mAP50-95:	100% 4/4 [
292/399 00, 5.04it/s]	2.07G	0.02882	0.02785	0.001067	192	416:	100%	28/28	[00:05<00:
00:00<00:00, 4.77it/s]	Class all	Images	Instances	P	R				
		128	993	0.857	0.714	0.789	0.475		
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size	mAP50	mAP50-95:	100% 4/4 [
293/399 00, 5.01it/s]	2.07G	0.02902	0.02935	0.001364	172	416:	100%	28/28	[00:05<00:
00:00<00:00, 4.73it/s]	Class all	Images	Instances	P	R				
		128	993	0.859	0.712	0.794	0.479		

Stopping training early as no improvement observed in last 100 epochs. Best results observed at epoch 193, best model saved as best.pt.
To update EarlyStopping(patience=100) pass a new patience value, i.e. `python train.py --patience 300` or use `--patience 0` to disable EarlyStopping.

294 epochs completed in 0.559 hours

Optimizer stripped from runs/train/exp/weights/last.pt, 14.3MB

Optimizer stripped from runs/train/exp/weights/best.pt, 14.3MB

Validating runs/train/exp/weights/best.pt...

Fusing layers...

Model summary: 157 layers, 7029004 parameters, 0 gradients, 15.8 GFLOPs

	Class	Images	Instances	P	R	mAP50	mAP50-95: 100%	4/4 [
00:03<00:00,	1.14it/s]							
	all	128	993	0.842	0.738	0.798	0.486	
	fish	128	504	0.807	0.656	0.723	0.385	
	jellyfish	128	226	0.878	0.796	0.869	0.534	
	penguin	128	86	0.872	0.767	0.846	0.434	
	puffin	128	51	0.777	0.667	0.64	0.34	
	shark	128	67	0.784	0.701	0.805	0.494	
	starfish	128	20	0.898	0.883	0.934	0.708	
	stingray	128	39	0.876	0.692	0.77	0.505	

Results saved to runs/train/exp

Evaluate Custom YOLOv5 Detector Performance

Using tensorboard we are going to evaluate our model.

In []:

```
# Start tensorboard
# Launch after you have started training
# logs save in the folder "runs"
%load_ext tensorboard
%tensorboard --logdir runs
```

In []:

```
# Run inference with trained weights
!python detect.py --weights runs/train/exp/weights/best.pt --img 416 --conf 0.1 --source {dataset.location}/test/images
```

```
detect: weights=['runs/train/exp/weights/best.pt'], source=/content/datasets/fish-1/test/images, data=coco128.yaml, imgsz=[416, 416], conf_thres=0.1, iou_thres=0.45, max_det=1000, device=, view_img=False, save_txt=False, save_conf=False, save_crop=False, nosave=False, classes=None, agnostic_nms=False, augment=False, visualize=False, update=False, project=runs/detect, name=exp, exist_ok=False, line_thickness=3, hide_labels=False, hide_conf=False, half=False, dnn=False, vid_stride=1
YOLOv5 v7.0-71-gc442a2e Python-3.8.10 torch-1.13.1+cu116 CUDA:0 (Tesla T4, 15110MiB)
```

Fusing layers...

```
Model summary: 157 layers, 7029004 parameters, 0 gradients, 15.8 GFLOPs
image 1/63 /content/datasets/fish-1/test/images/IMG_2298.jpeg.rf.6fc31257f43a6f3bb3c4f7e44bb966d0.jpg: 416x416 8 puffins, 8.3ms
image 2/63 /content/datasets/fish-1/test/images/IMG_2304.jpeg.rf.rf.036da64118c64326b72acfc230a0b48e.jpg: 416x416 14 penguins, 9.2ms
image 3/63 /content/datasets/fish-1/test/images/IMG_2311.jpeg.rf.rf.68f11e5acd510450caa3b09142ebd318.jpg: 416x416 1 penguin, 8.8ms
image 4/63 /content/datasets/fish-1/test/images/IMG_2322.jpeg.rf.rf.d953b6f4edb65fc8f46b32544b9b108c.jpg: 416x416 23 penguins, 8.9ms
image 5/63 /content/datasets/fish-1/test/images/IMG_2352.jpeg.rf.rf.e35cf0992ba07451296021e9852558c9.jpg: 416x416 3 penguins, 1 starfish, 8.8ms
image 6/63 /content/datasets/fish-1/test/images/IMG_2370.jpeg.rf.rf.1b601a38384256840af13d4bf5ae2278.jpg: 416x416 4 fishes, 8.4ms
image 7/63 /content/datasets/fish-1/test/images/IMG_2373.jpeg.rf.rf.e8aba66244ca589f64745cf0ed674edb.jpg: 416x416 1 fish, 1 starfish, 8.9ms
image 8/63 /content/datasets/fish-1/test/images/IMG_2375.jpeg.rf.rf.28bcb7eba2f3c23c3d87f52167223325.jpg: 416x416 1 fish, 8.9ms
image 9/63 /content/datasets/fish-1/test/images/IMG_2384.jpeg.rf.rf.75dd4d152d6aac33b47f7bcea6d884dd.jpg: 416x416 1 fish, 1 starfish, 8.4ms
image 10/63 /content/datasets/fish-1/test/images/IMG_2405.jpeg.rf.rf.824ad31aabfe8760577ae739e0e76904.jpg: 416x416 6 fishes, 8.2ms
image 11/63 /content/datasets/fish-1/test/images/IMG_2415.jpeg.rf.rf.71994e70c563aaafc4bbcacb9ecbe8435.jpg: 416x416 19 fishes, 1 shark, 8.2ms
image 12/63 /content/datasets/fish-1/test/images/IMG_2418.jpeg.rf.rf.b9f7491c70dd5577a609f0122670038a.jpg: 416x416 23 fishes, 2 sharks, 2 stingrays, 8.2ms
image 13/63 /content/datasets/fish-1/test/images/IMG_2435.jpeg.rf.rf.40de207629bf0552c1f398f3ae4ce06c.jpg: 416x416 8 fishes, 1 shark, 8.2ms
image 14/63 /content/datasets/fish-1/test/images/IMG_2444.jpeg.rf.rf.b56b24896534111a3245e963c4e8cd3e.jpg: 416x416 14 fishes, 4 sharks, 8.7ms
image 15/63 /content/datasets/fish-1/test/images/IMG_2449.jpeg.rf.rf.17e393c419d57ad5d57d72f4728735c7.jpg: 416x416 19 fishes, 5 sharks, 8.4ms
image 16/63 /content/datasets/fish-1/test/images/IMG_2469.jpeg.rf.rf.c600f69bf682818937703ef5729a3155.jpg: 416x416 21 jellyfishs, 9.2ms
image 17/63 /content/datasets/fish-1/test/images/IMG_2494.jpeg.rf.rf.4beb1d6ba29c67e0c9f1629ae00267e2.jpg: 416x416 25 fishes, 5 sharks, 1 stingray, 8.6ms
image 18/63 /content/datasets/fish-1/test/images/IMG_2504.jpeg.rf.rf.862b2ea8301eddcbdb3e168bd3a536dd.jpg: 416x416 13 fishes, 3 sharks, 8.2ms
image 19/63 /content/datasets/fish-1/test/images/IMG_2517.jpeg.rf.rf.1dcdfb92d458d632b95bea285c4d29e1.jpg: 416x416 1 fish, 1 shark, 1 stingray, 8.2ms
image 20/63 /content/datasets/fish-1/test/images/IMG_2523.jpeg.rf.rf.2de7d47742dc5c0da171efedc7503110.jpg: 416x416 1 fish, 26 puffins, 8.1ms
image 21/63 /content/datasets/fish-1/test/images/IMG_2532.jpeg.rf.rf.0451abf9a71fc347ce5175005b3a9a1e.jpg: 416x416 3 starfishs, 8.2ms
image 22/63 /content/datasets/fish-1/test/images/IMG_2533.jpeg.rf.rf.c7904822bfe93389f2131fe7905e18c6.jpg: 416x416 1 fish, 3 starfishs, 8.1ms
image 23/63 /content/datasets/fish-1/test/images/IMG_2536.jpeg.rf.rf.080362df656db5c477f63790206a2453.jpg: 416x416 1 fish, 1 starfish, 8.2ms
image 24/63 /content/datasets/fish-1/test/images/IMG_2557.jpeg.rf.rf.c0cc4e818ce5736c8eed3e046753a5e.jpg: 416x416 1 stingray, 8.2ms
image 25/63 /content/datasets/fish-1/test/images/IMG_2558.jpeg.rf.rf.65914b818b6895c49863a305d3bf5e c7.jpg: 416x416 12 fishes, 8 sharks, 1 stingray, 8.2ms
image 26/63 /content/datasets/fish-1/test/images/IMG_2560.jpeg.rf.rf.5858c0ecc76a95b079456aa584dc2b33.jpg: 416x416 10 fishes, 3 sharks, 1 stingray, 9.4ms
image 27/63 /content/datasets/fish-1/test/images/IMG_2565.jpeg.rf.rf.5aec66a6cf456177497fc920a8833192.jpg: 416x416 5 fishes, 2 sharks, 1 stingray, 8.2ms
image 28/63 /content/datasets/fish-1/test/images/IMG_2579.jpeg.rf.rf.8f614d492075f6edb32f557cc8273fe1.jpg: 416x416 20 fishes, 4 sharks, 2 stingrays, 8.7ms
image 29/63 /content/datasets/fish-1/test/images/IMG_2585.jpeg.rf.rf.5f32306408ffd760a6233a02f5b5d6bb.jpg: 416x416 3 stingrays, 11.9ms
image 30/63 /content/datasets/fish-1/test/images/IMG_2588.jpeg.rf.rf.56251f92dc3c1e1bad20729eeef6cb4
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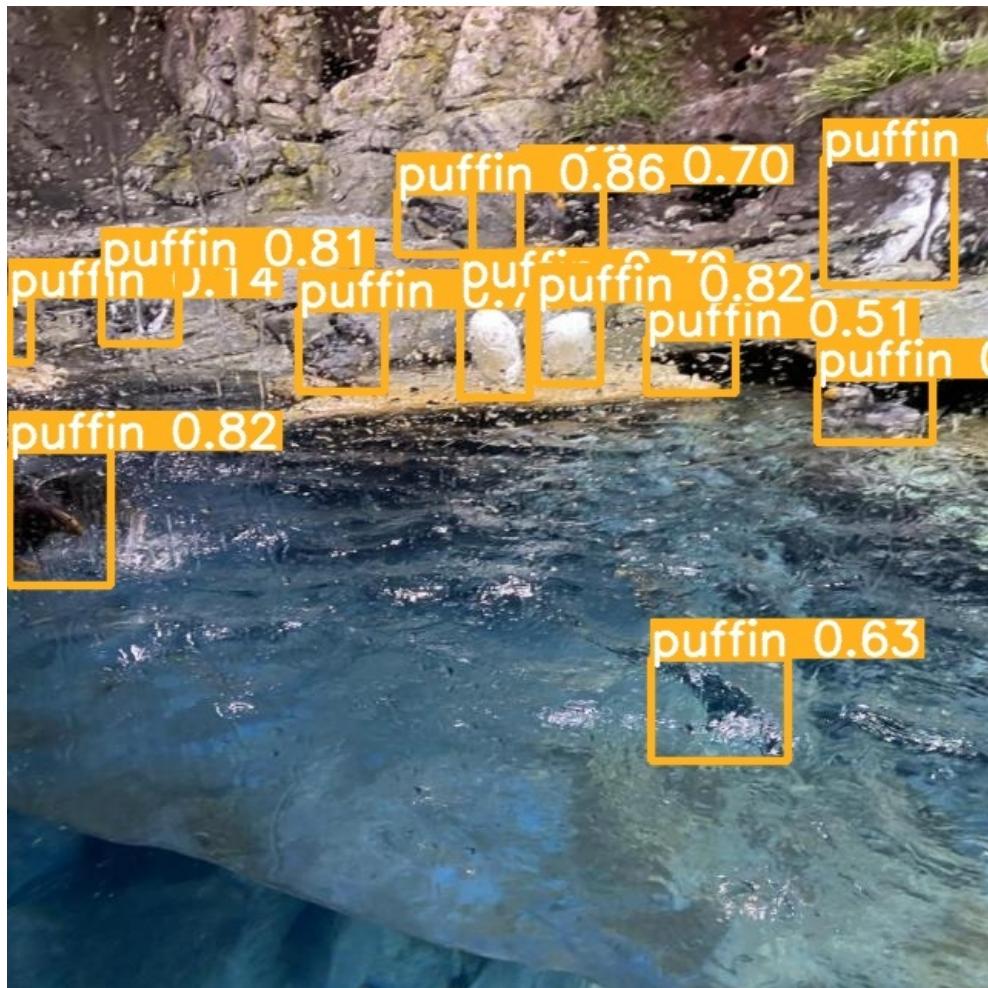
af.jpg: 416x416 4 stingrays, 8.3ms
 image 31/63 /content/datasets/fish-1/test/images/IMG_2593.jpeg.jpg.rf.9dcaddf5d4ae064cbf194b6ab6aefb
 58.jpg: 416x416 4 fishes, 1 shark, 1 stingray, 8.1ms
 image 32/63 /content/datasets/fish-1/test/images/IMG_2607.jpeg.jpg.rf.7a6c4a12a93362234b24a2e49e30ea
 0a.jpg: 416x416 10 fishes, 4 sharks, 1 stingray, 8.2ms
 image 33/63 /content/datasets/fish-1/test/images/IMG_2620.jpeg.jpg.rf.7184e8514c9b5ed372ffbcf7325c68
 2d.jpg: 416x416 2 fishes, 1 stingray, 8.2ms
 image 34/63 /content/datasets/fish-1/test/images/IMG_2640.jpeg.jpg.rf.702f9a193d599607b51fbde2ba3c1
 ba.jpg: 416x416 1 stingray, 8.1ms
 image 35/63 /content/datasets/fish-1/test/images/IMG_2655.jpeg.jpg.rf.c06ae257d719766bf0eb261fb280da
 c5.jpg: 416x416 2 stingrays, 8.2ms
 image 36/63 /content/datasets/fish-1/test/images/IMG_2657.jpeg.jpg.rf.29c074e1588a80654de22a1a9a1573
 c3.jpg: 416x416 5 fishes, 1 shark, 9.2ms
 image 37/63 /content/datasets/fish-1/test/images/IMG_3121.jpeg.jpg.rf.31152be397d63a40c8f2646c2ba78c
 85.jpg: 416x416 5 starfishs, 9.2ms
 image 38/63 /content/datasets/fish-1/test/images/IMG_3126.jpeg.jpg.rf.089ab7e7ea3a78eef23cc866fb81c
 6c.jpg: 416x416 1 fish, 4 starfishs, 8.2ms
 image 39/63 /content/datasets/fish-1/test/images/IMG_3134.jpeg.jpg.rf.8494acbce1c29ea685fb2759b6cccd6
 e4.jpg: 416x416 4 puffins, 8.2ms
 image 40/63 /content/datasets/fish-1/test/images/IMG_3140.jpeg.jpg.rf.bdc84fbedf9e2a61cf2adbed96bfae
 21.jpg: 416x416 12 puffins, 8.2ms
 image 41/63 /content/datasets/fish-1/test/images/IMG_3148.jpeg.jpg.rf.78f3a5e0eb9eb6d4892b913f4d5ac2
 4a.jpg: 416x416 1 puffin, 8.2ms
 image 42/63 /content/datasets/fish-1/test/images/IMG_3152.jpeg.jpg.rf.640de7373e4d8f8f3dee531cb4f479
 4d.jpg: 416x416 3 puffins, 8.3ms
 image 43/63 /content/datasets/fish-1/test/images/IMG_3173.jpeg.jpg.rf.9dd4df5f5709d79c6d4b2497dcf6b3
 8c.jpg: 416x416 10 penguins, 8.8ms
 image 44/63 /content/datasets/fish-1/test/images/IMG_3178.jpeg.jpg.rf.c3c3e92efab4d5bece997907b78069
 6b.jpg: 416x416 2 fishes, 8.1ms
 image 45/63 /content/datasets/fish-1/test/images/IMG_3179.jpeg.jpg.rf.c1ae586f7212418351643c14df61fe
 20.jpg: 416x416 2 fishes, 1 starfish, 8.2ms
 image 46/63 /content/datasets/fish-1/test/images/IMG_3181.jpeg.jpg.rf.5128770221a6c40ebc883f3859d54c
 a4.jpg: 416x416 1 fish, 2 starfishs, 8.2ms
 image 47/63 /content/datasets/fish-1/test/images/IMG_8420.jpeg.rf.c2eb246730c16ed27a7933858c7b28fa.jp
 g: 416x416 37 fishes, 2 sharks, 8.3ms
 image 48/63 /content/datasets/fish-1/test/images/IMG_8445.jpeg.rf.4ee3c8d9343f149e2a1e2a92fdde2dc1.jp
 g: 416x416 26 fishes, 1 jellyfish, 1 shark, 2 stingrays, 8.2ms
 image 49/63 /content/datasets/fish-1/test/images/IMG_8502.jpeg.rf.29074c14878aaddaf58849668eb70cc7.jp
 g: 416x416 4 fishes, 8.3ms
 image 50/63 /content/datasets/fish-1/test/images/IMG_8517_MOV-0.jpg.rf.1fea754eadee7927df4f87c85928d
 28d.jpg: 416x416 6 fishes, 12.5ms
 image 51/63 /content/datasets/fish-1/test/images/IMG_8520.jpeg.rf.2e20c6217a1af671e8b62549f7e155e7.jp
 g: 416x416 17 fishes, 2 puffins, 8.6ms
 image 52/63 /content/datasets/fish-1/test/images/IMG_8525.jpeg.rf.0f1e734a56d4c44c48a7e45cc7d89cc6.jp
 g: 416x416 6 fishes, 8.2ms
 image 53/63 /content/datasets/fish-1/test/images/IMG_8534.jpeg.rf.ded2ba4bb161a7169abd8c4dbdd7971a.jp
 g: 416x416 9 puffins, 8.2ms
 image 54/63 /content/datasets/fish-1/test/images/IMG_8535_MOV-1.jpg.rf.2195bcf31a04461c9eb7c32d5134
 736.jpg: 416x416 9 puffins, 8.8ms
 image 55/63 /content/datasets/fish-1/test/images/IMG_8536.jpeg.rf.dd199338a55810901aa2a999aa36baa3.jp
 g: 416x416 10 fishes, 8.1ms
 image 56/63 /content/datasets/fish-1/test/images/IMG_8538.jpeg.rf.f071f29d882c5e1460d30993be07d799.jp
 g: 416x416 8 fishes, 8.2ms
 image 57/63 /content/datasets/fish-1/test/images/IMG_8545.jpeg.rf.9de3b9302da7ce7e9b7a23cf672ee696.jp
 g: 416x416 18 fishes, 8.2ms
 image 58/63 /content/datasets/fish-1/test/images/IMG_8551_MOV-2.jpg.rf.c0c7c293c0b08a9c168f9f64445fe
 e8e.jpg: 416x416 6 fishes, 1 penguin, 8.8ms
 image 59/63 /content/datasets/fish-1/test/images/IMG_8578_MOV-0.jpg.rf.58d1cc91cc140626570bdfb9590b4
 6c5.jpg: 416x416 1 fish, 8.2ms
 image 60/63 /content/datasets/fish-1/test/images/IMG_8579.jpeg.rf.df13aad58398dce547492ac2e0782223.jp
 g: 416x416 51 fishes, 1 jellyfish, 1 stingray, 8.5ms
 image 61/63 /content/datasets/fish-1/test/images/IMG_8590_MOV-5.jpg.rf.9c42b0632da35cedc77aef722deec
 3cf.jpg: 416x416 1 fish, 1 jellyfish, 1 stingray, 8.2ms
 image 62/63 /content/datasets/fish-1/test/images/IMG_8591_MOV-1.jpg.rf.7223fe0cbf72f6806b4f6e3f3df3d
 b4a.jpg: 416x416 16 jellyfishs, 8.2ms
 image 63/63 /content/datasets/fish-1/test/images/IMG_8599_MOV-0.jpg.rf.576be46281797dc6ac8343125cf1
 895.jpg: 416x416 8 jellyfishs, 8.2ms
 Speed: 0.3ms pre-process, 8.5ms inference, 1.0ms NMS per image at shape (1, 3, 416, 416)
 Results saved to runs/detect/exp

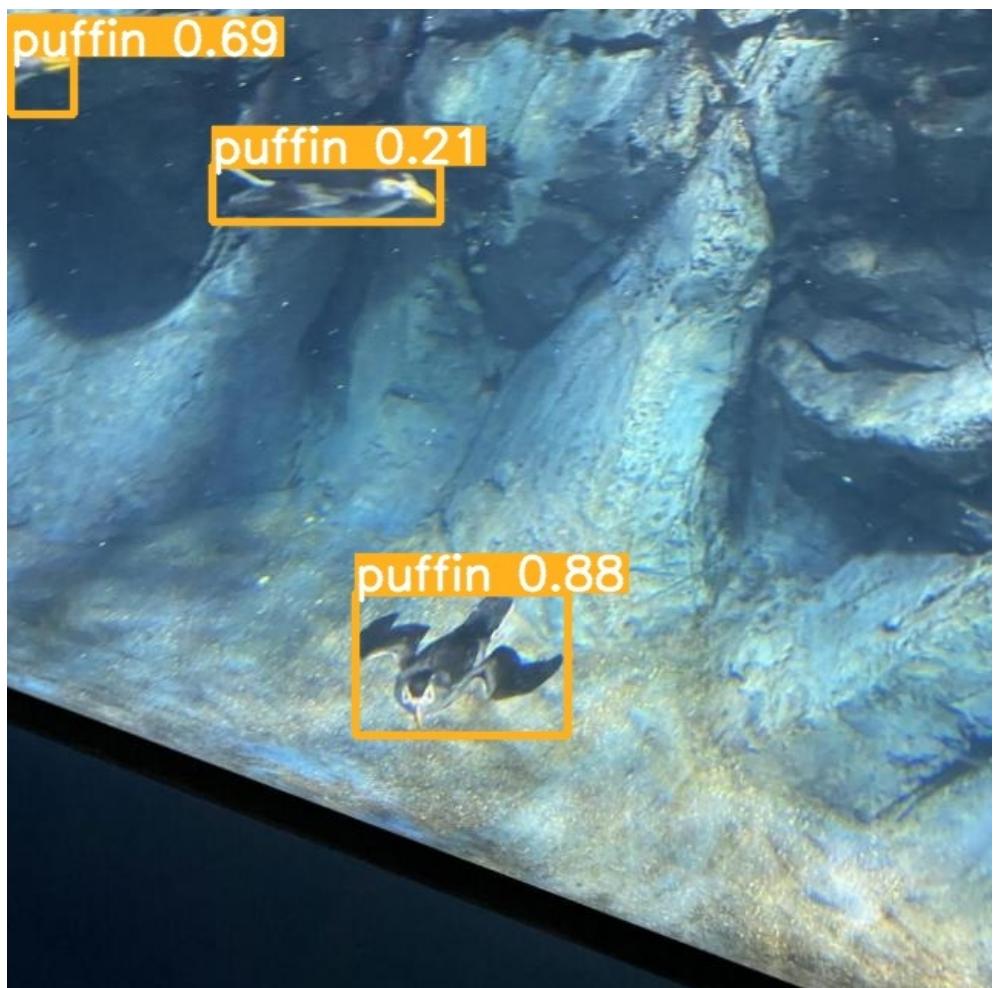
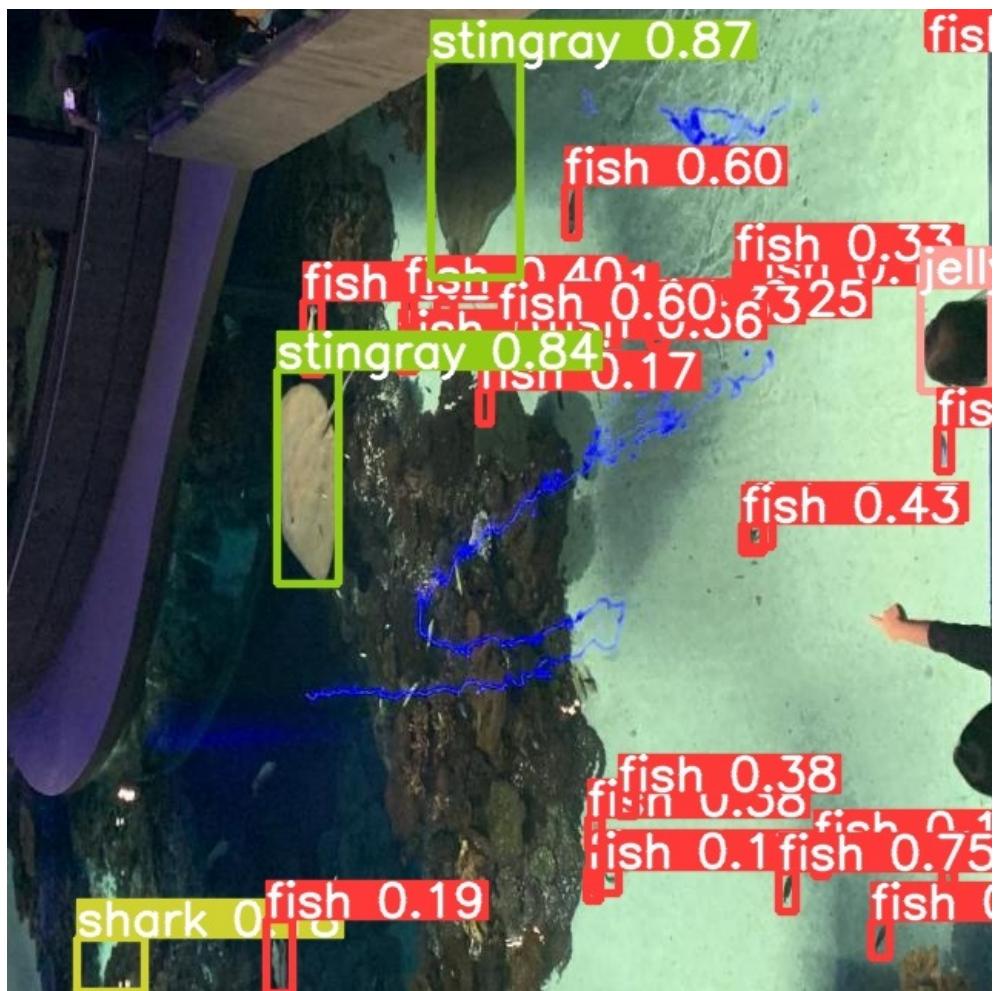
In []:

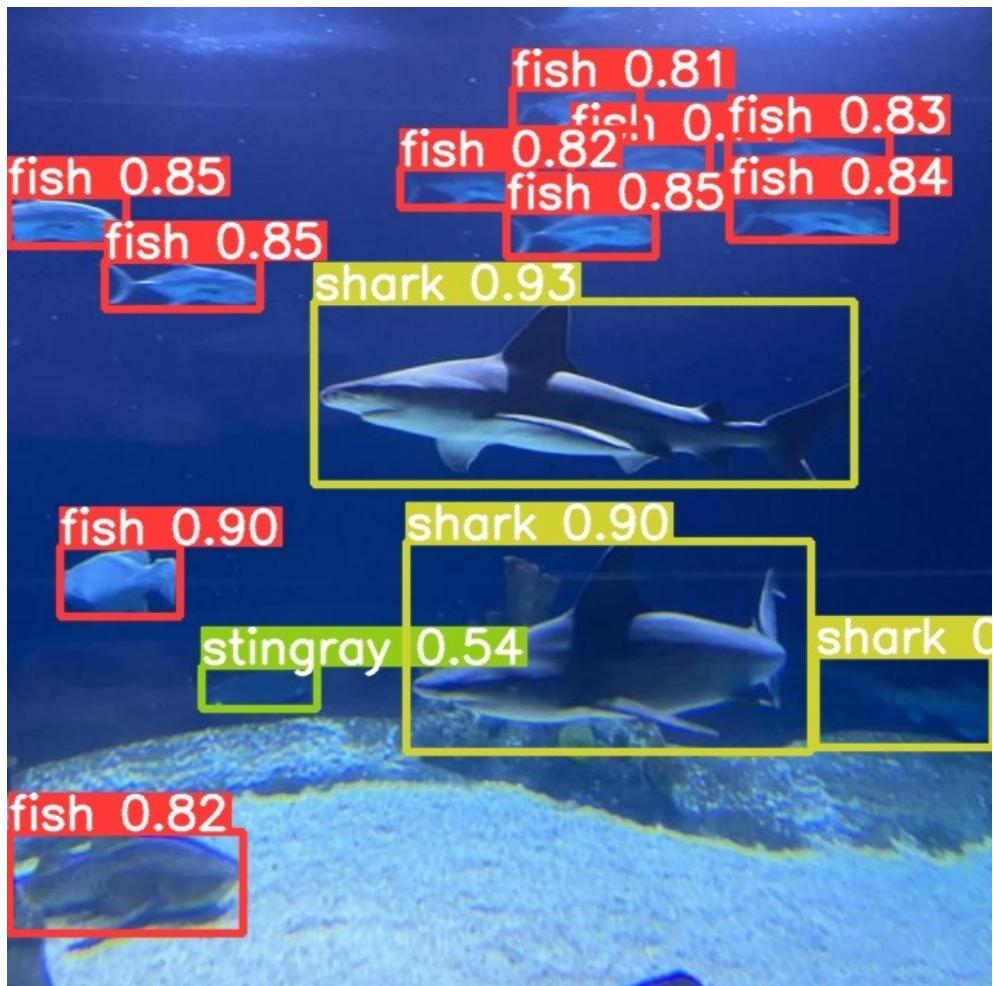
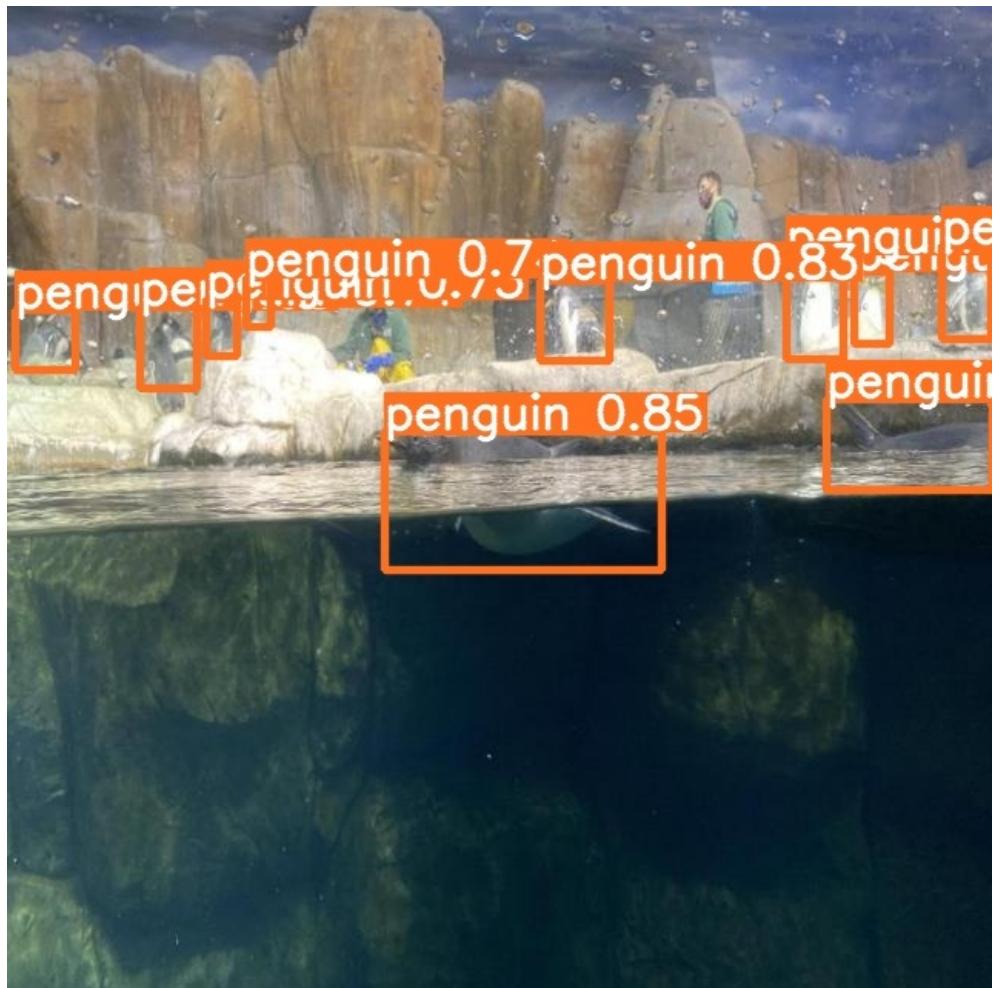
```
#display inference on ALL test images
```

```
import glob
from IPython.display import Image, display

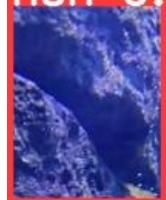
for imageName in glob.glob('/content/yolov5/runs/detect/exp/*.jpg'): #assuming JPG
    display(Image(filename=imageName))
    print("\n")
```







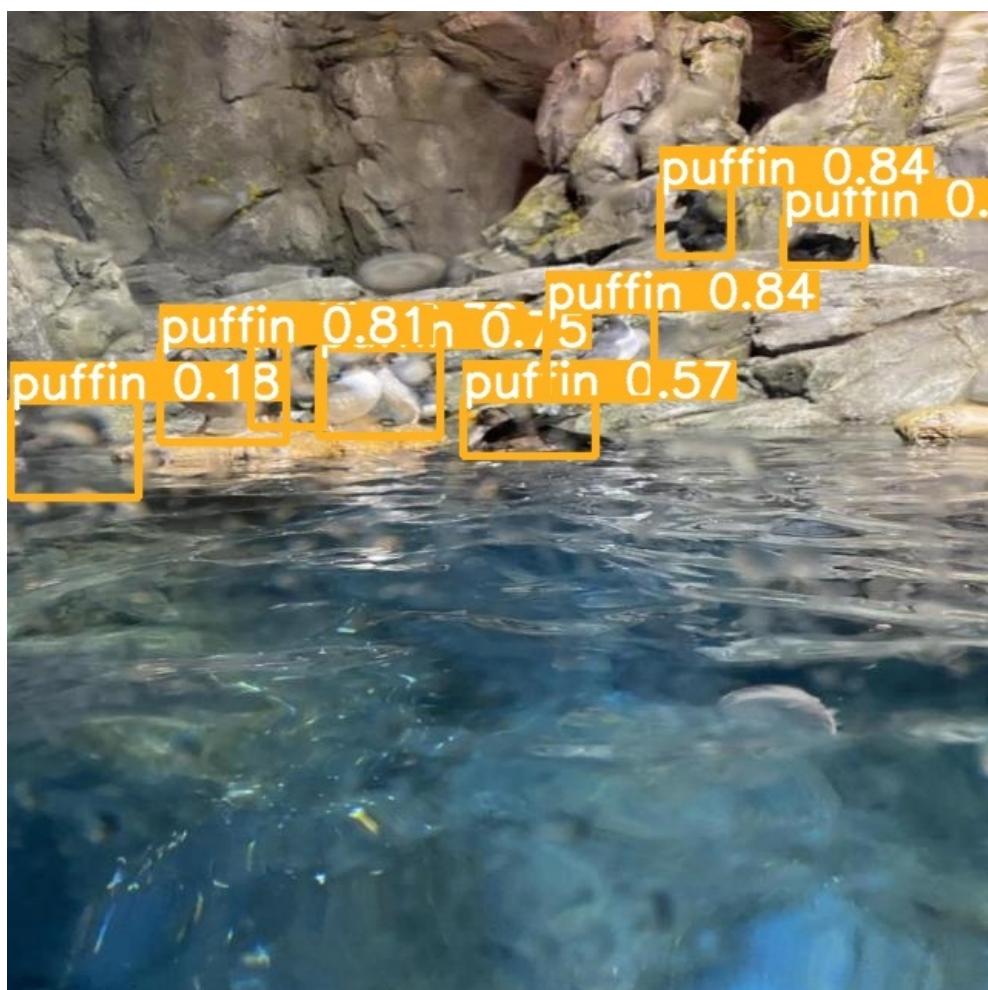
fish 0.11

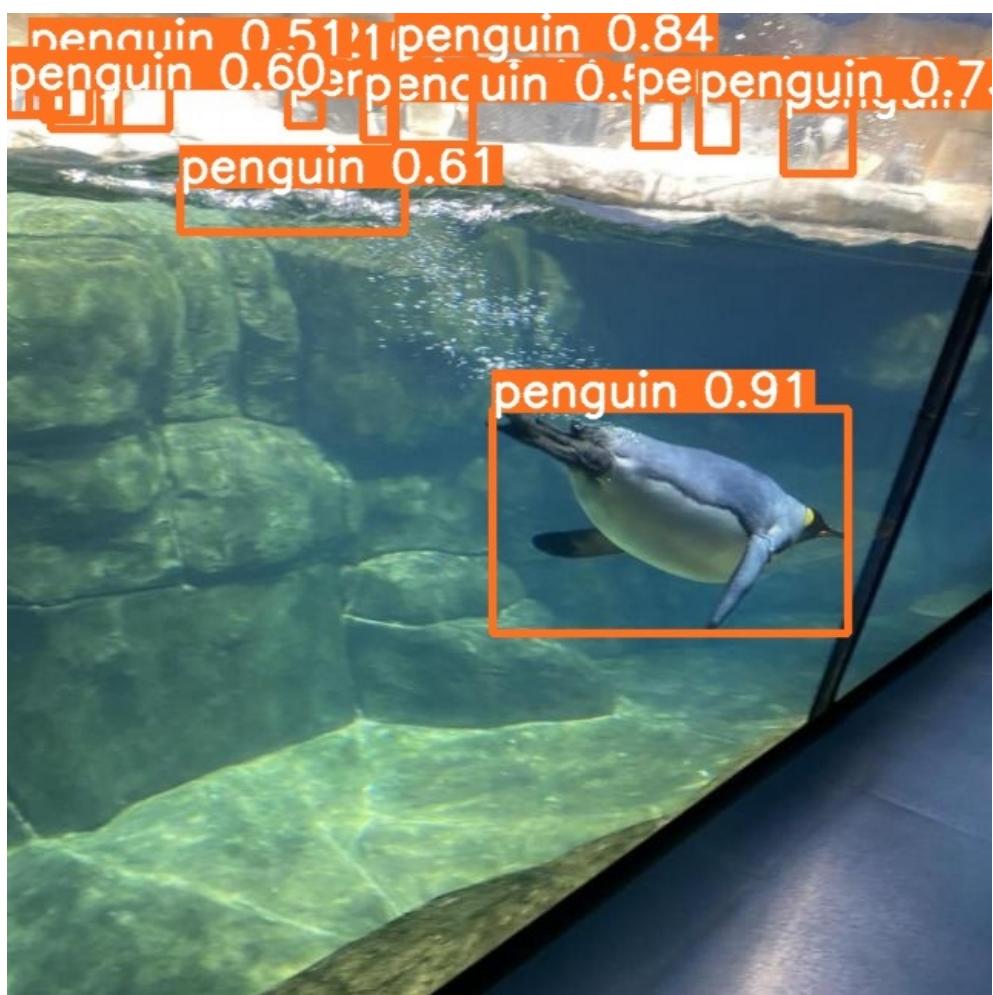
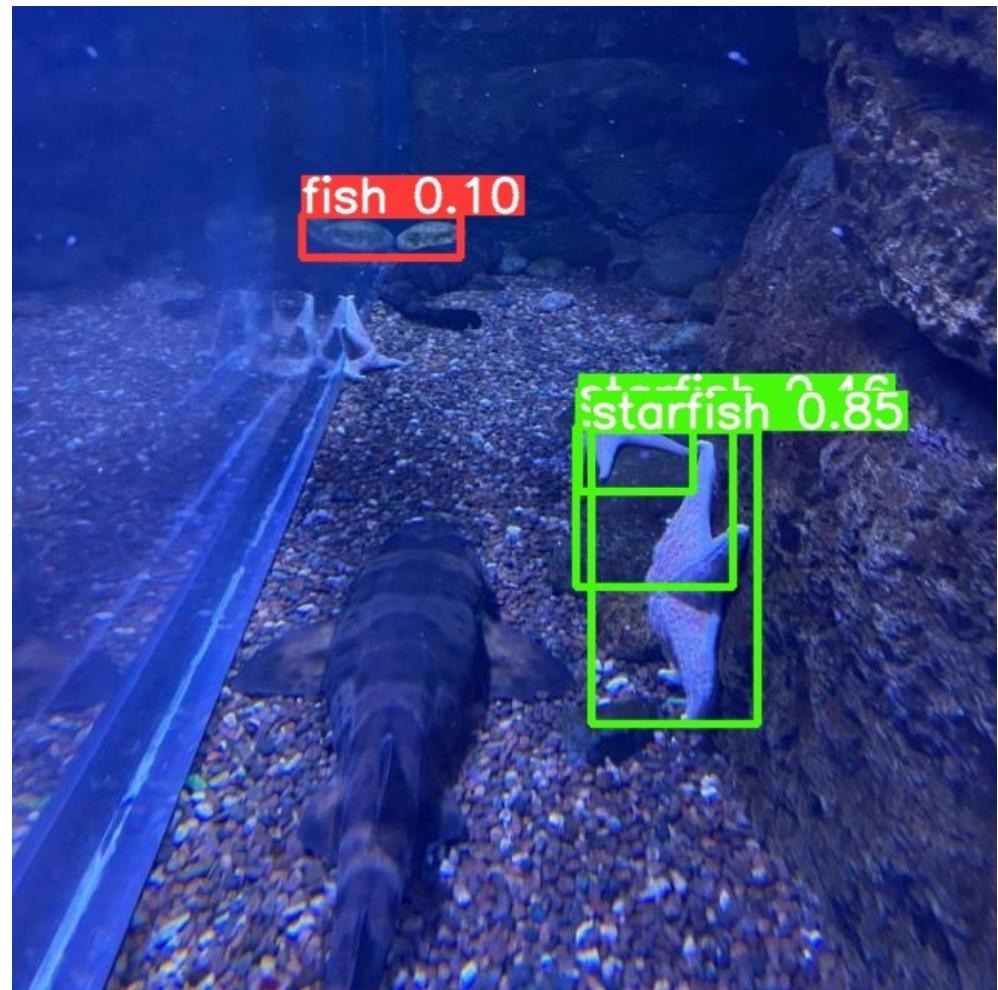


starfish 0.91

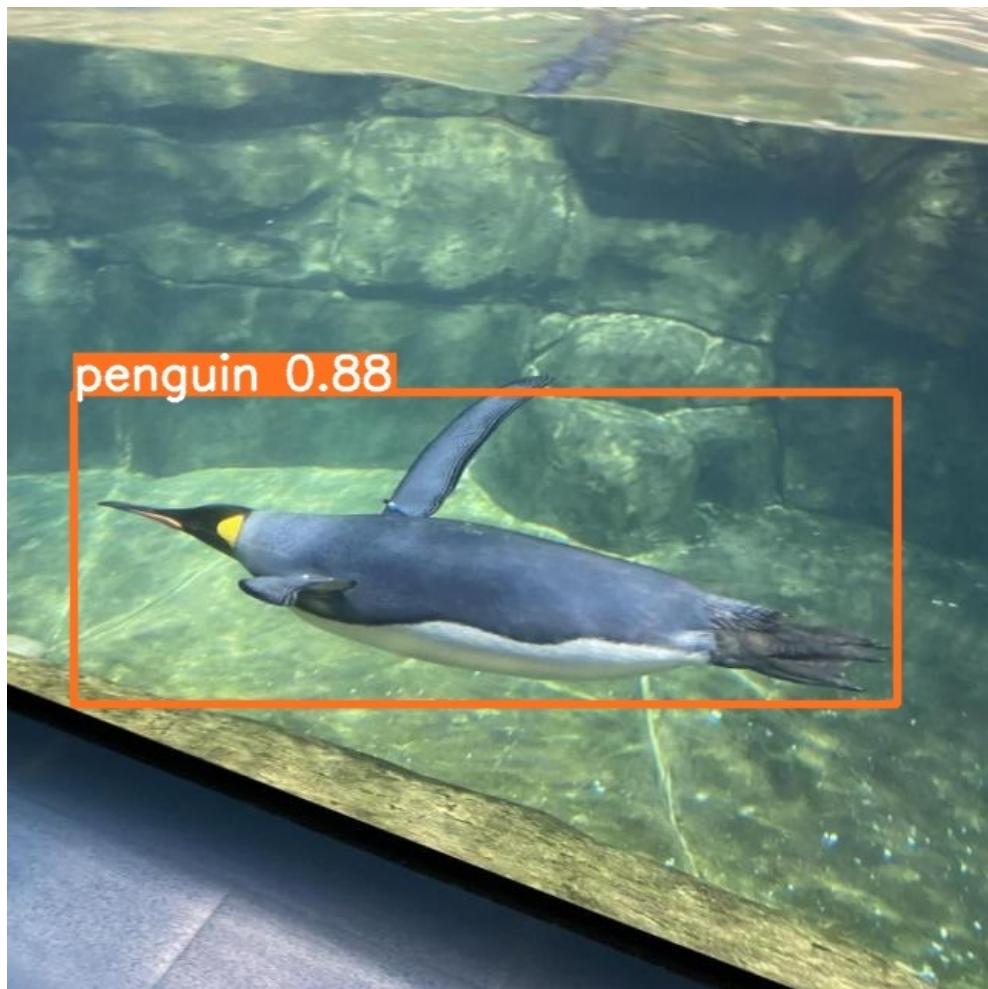
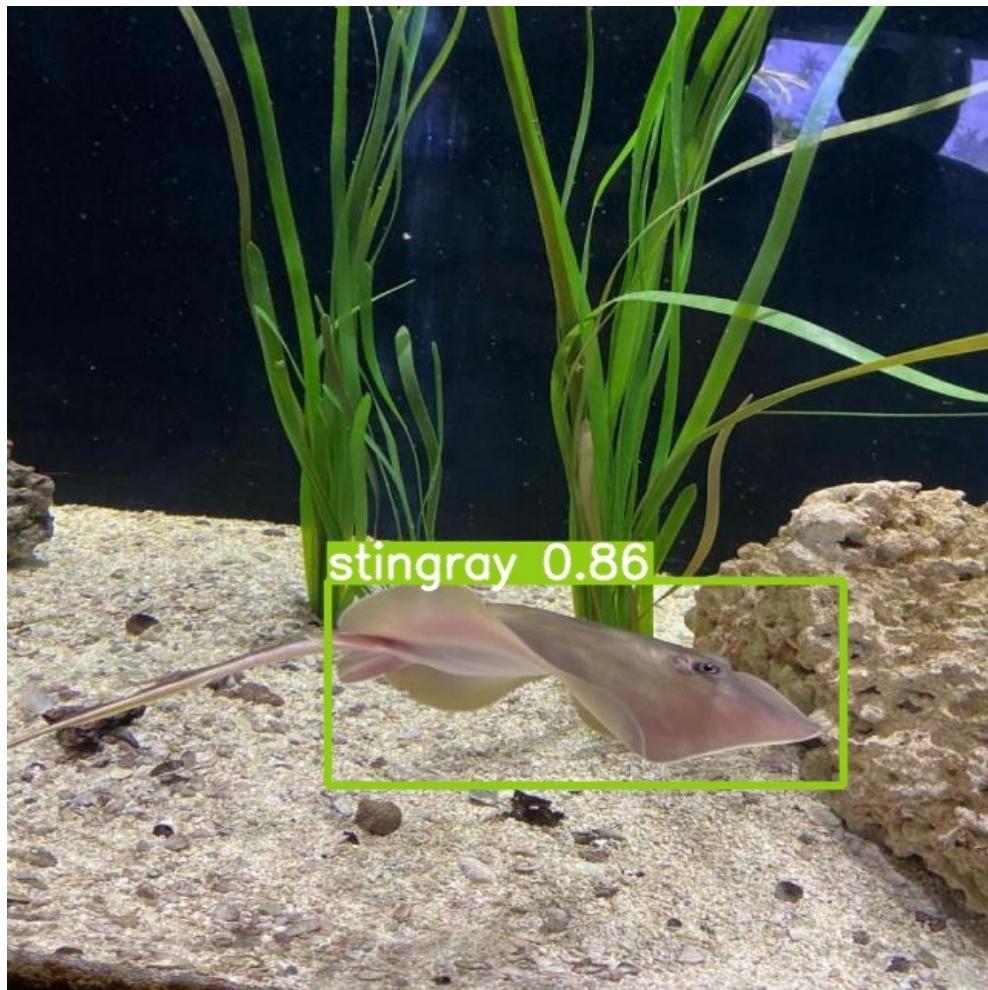


puffin







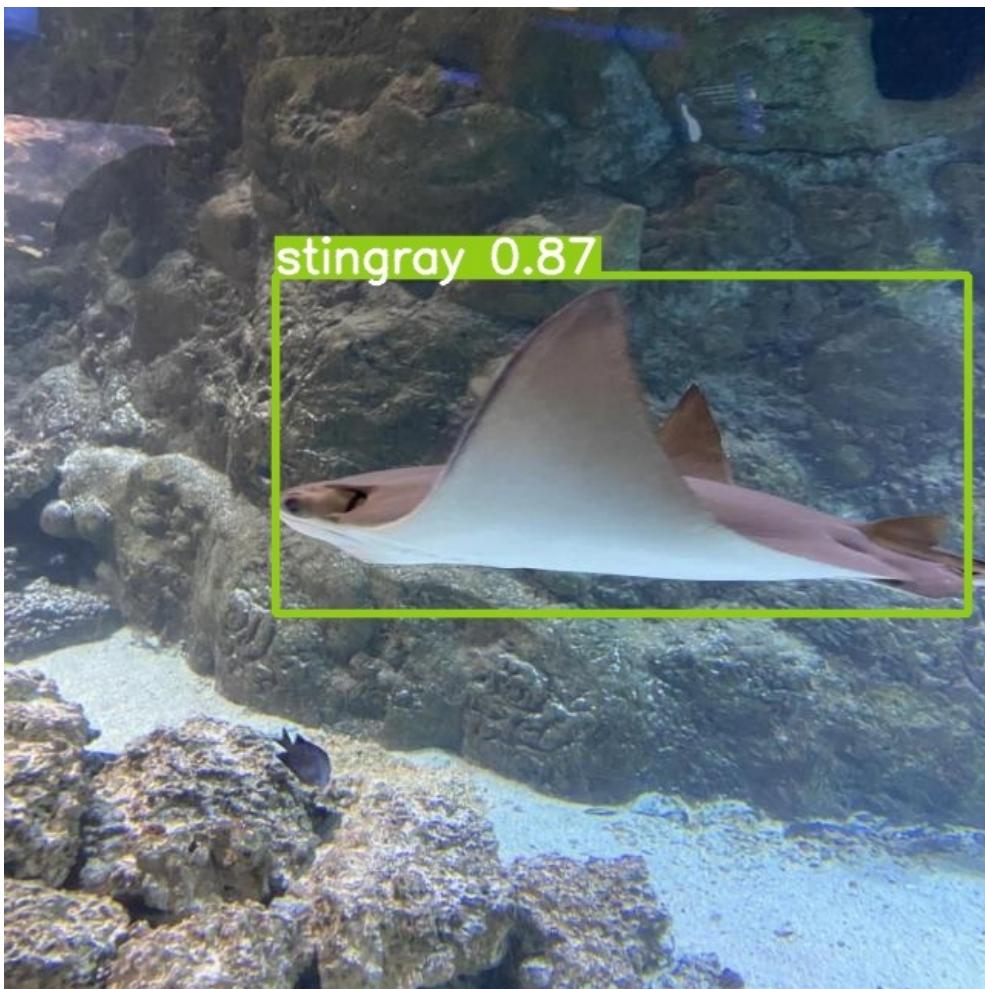
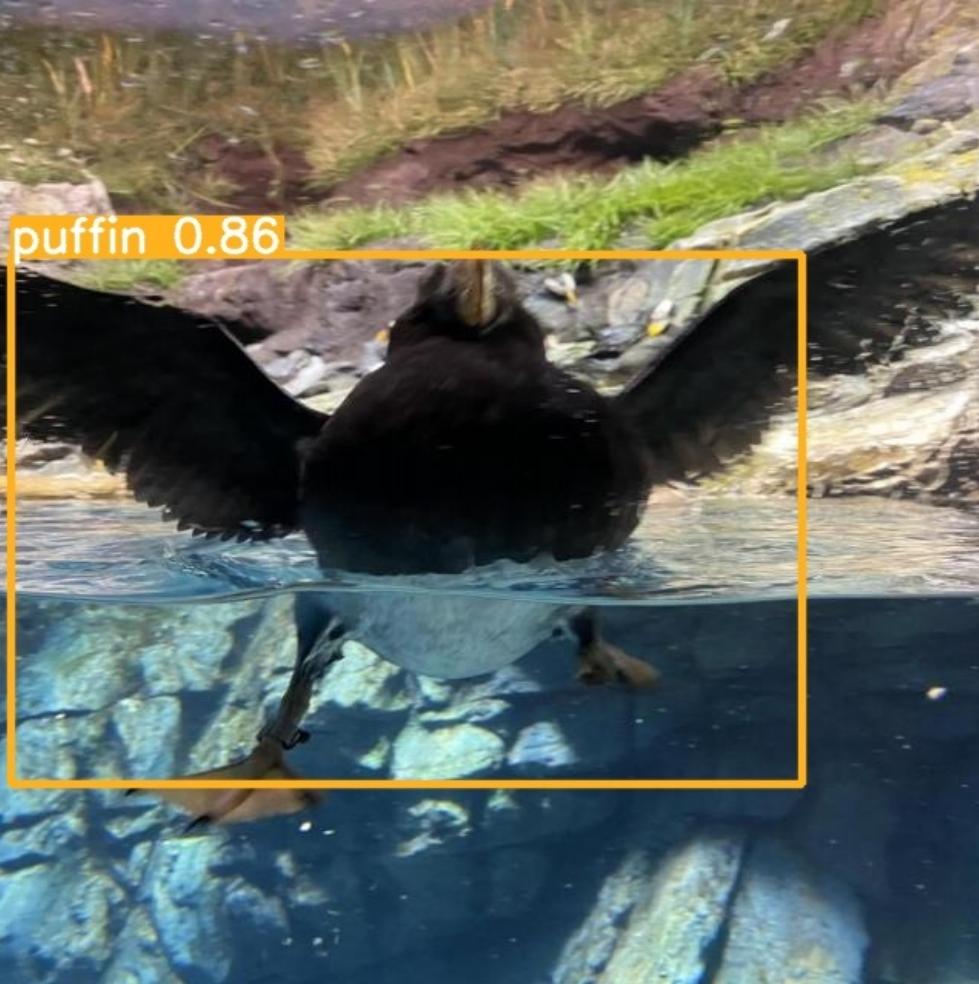


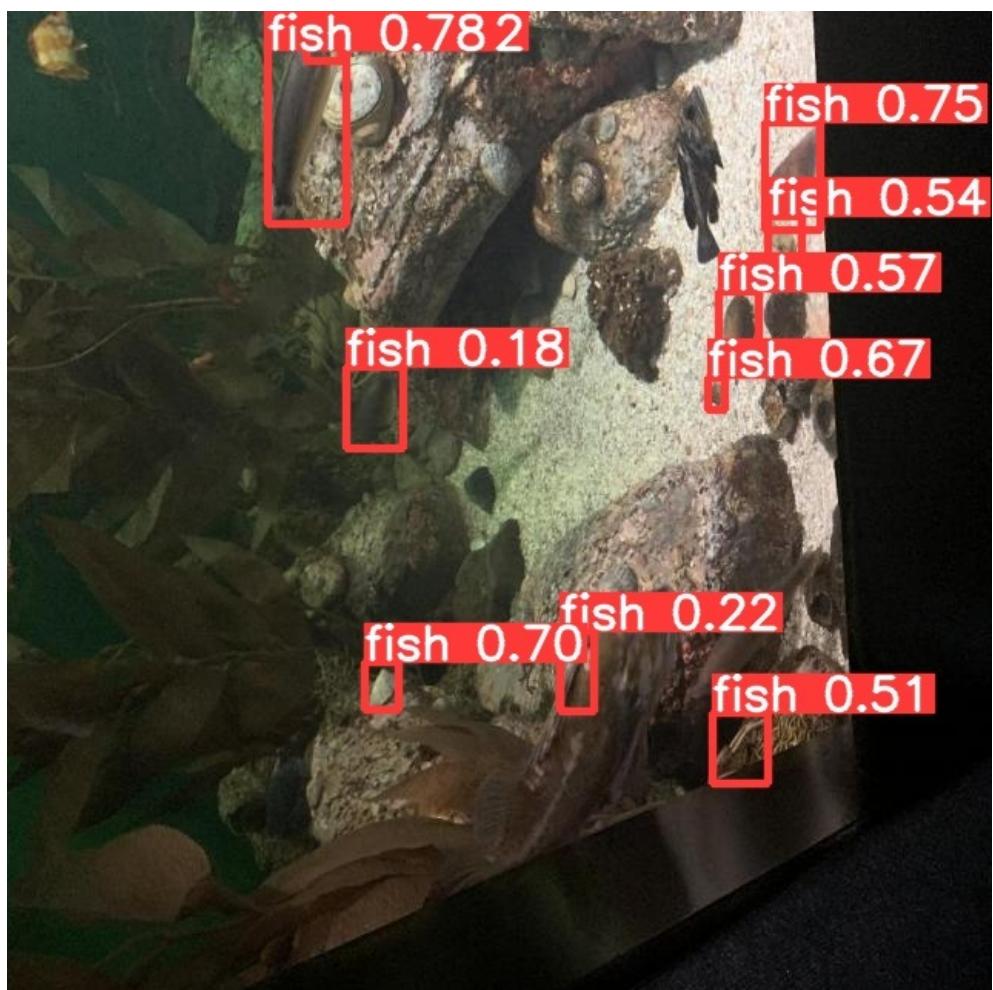
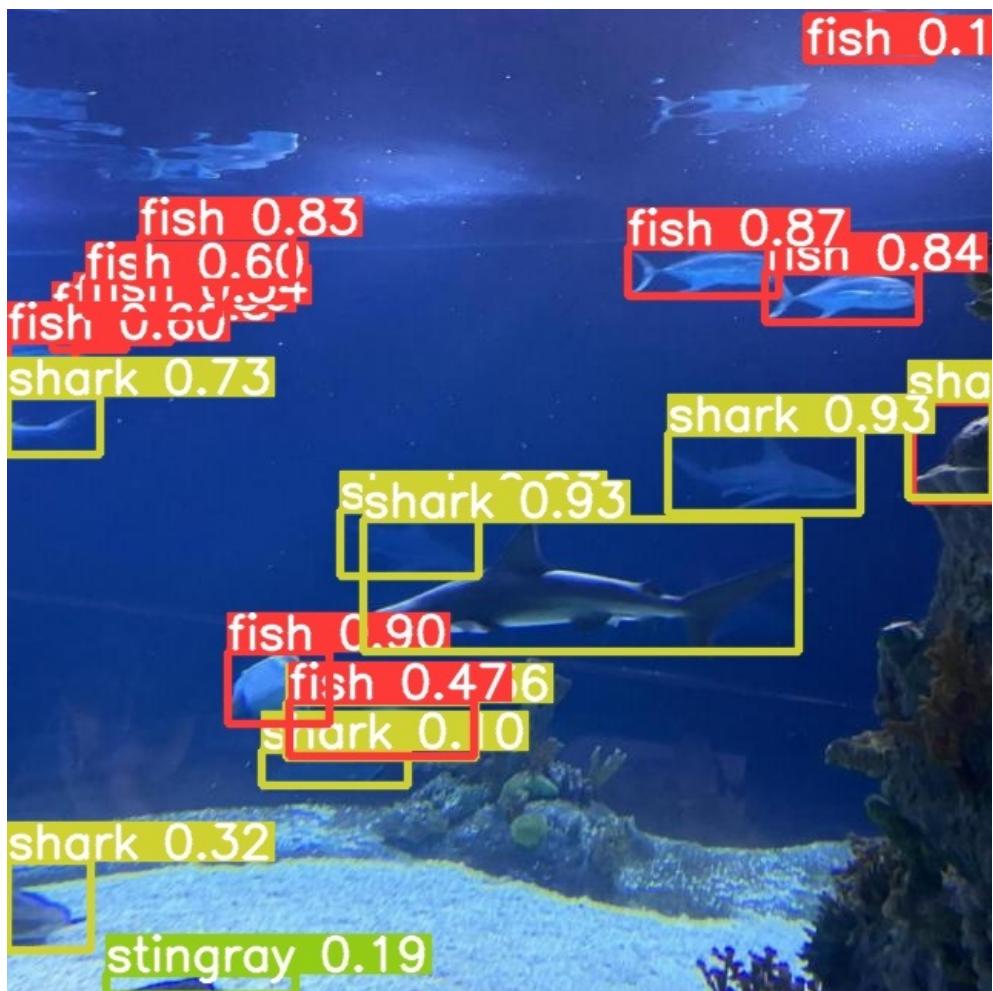
fish 0.91

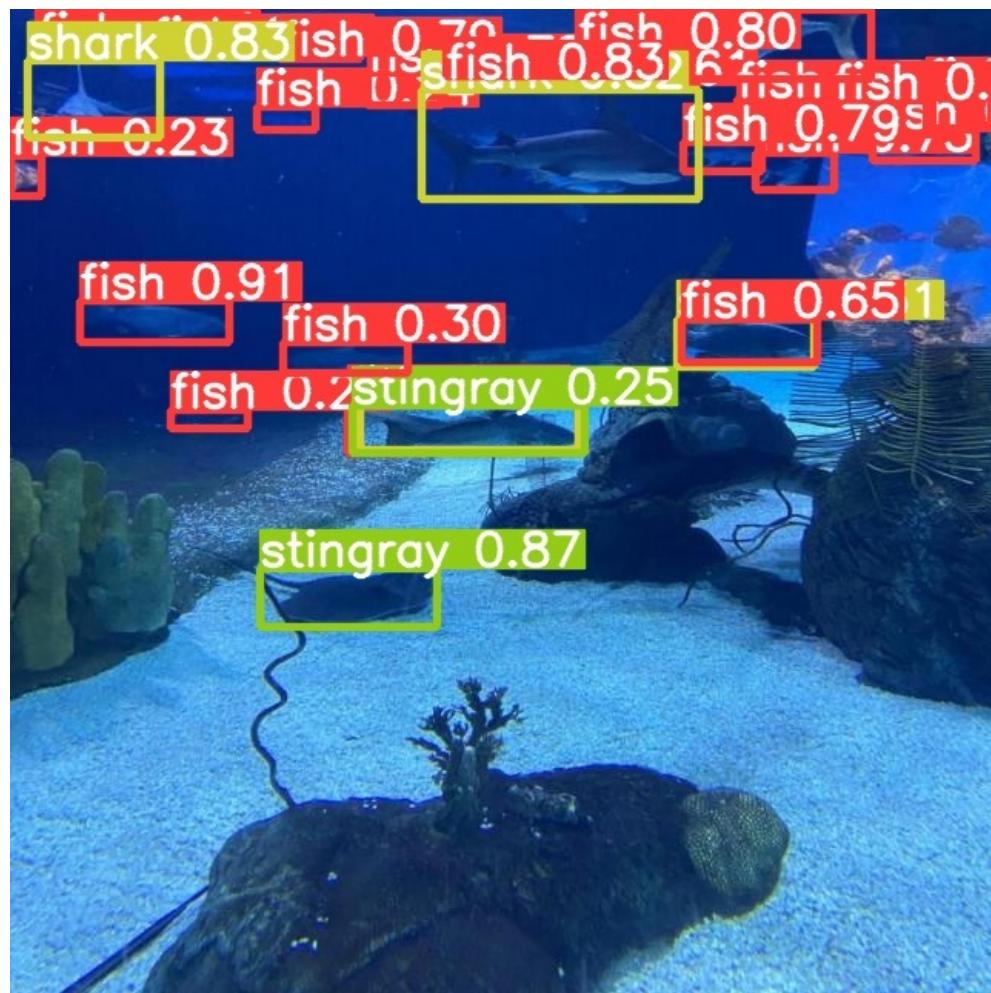


jellyfish 0.31

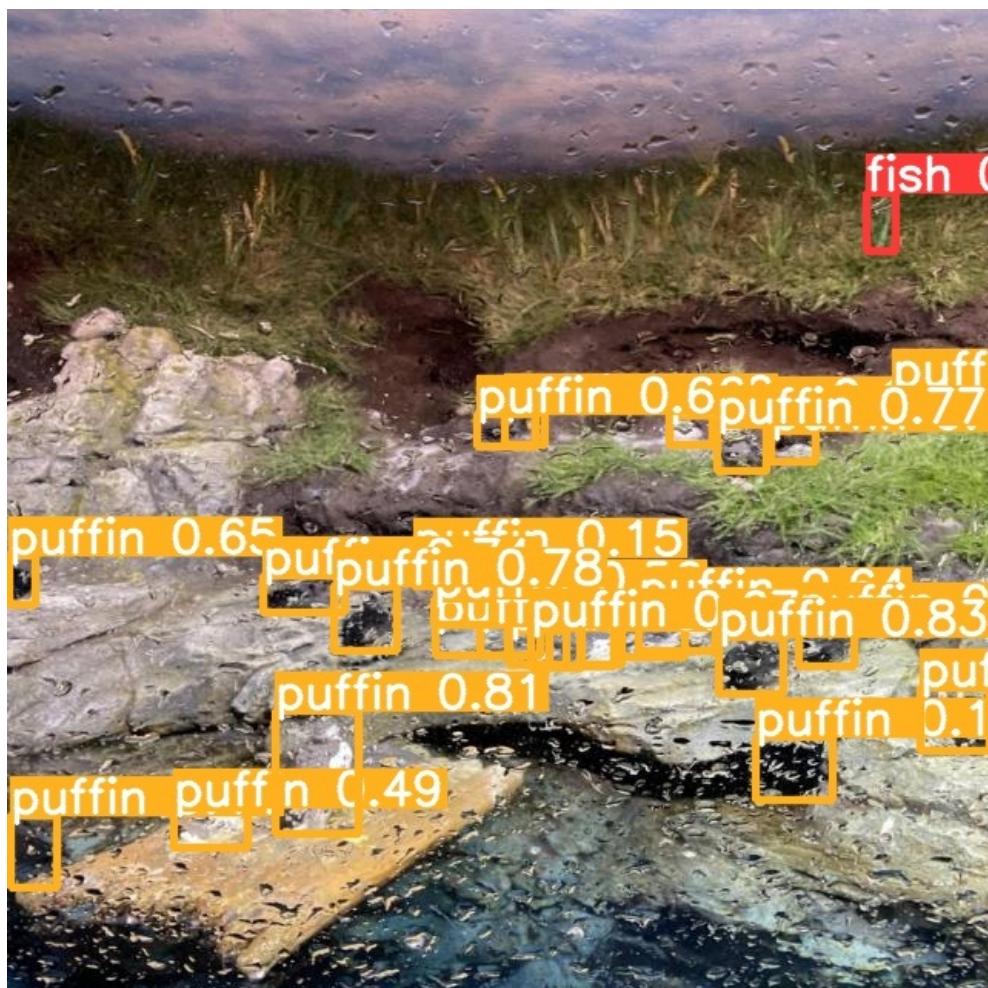
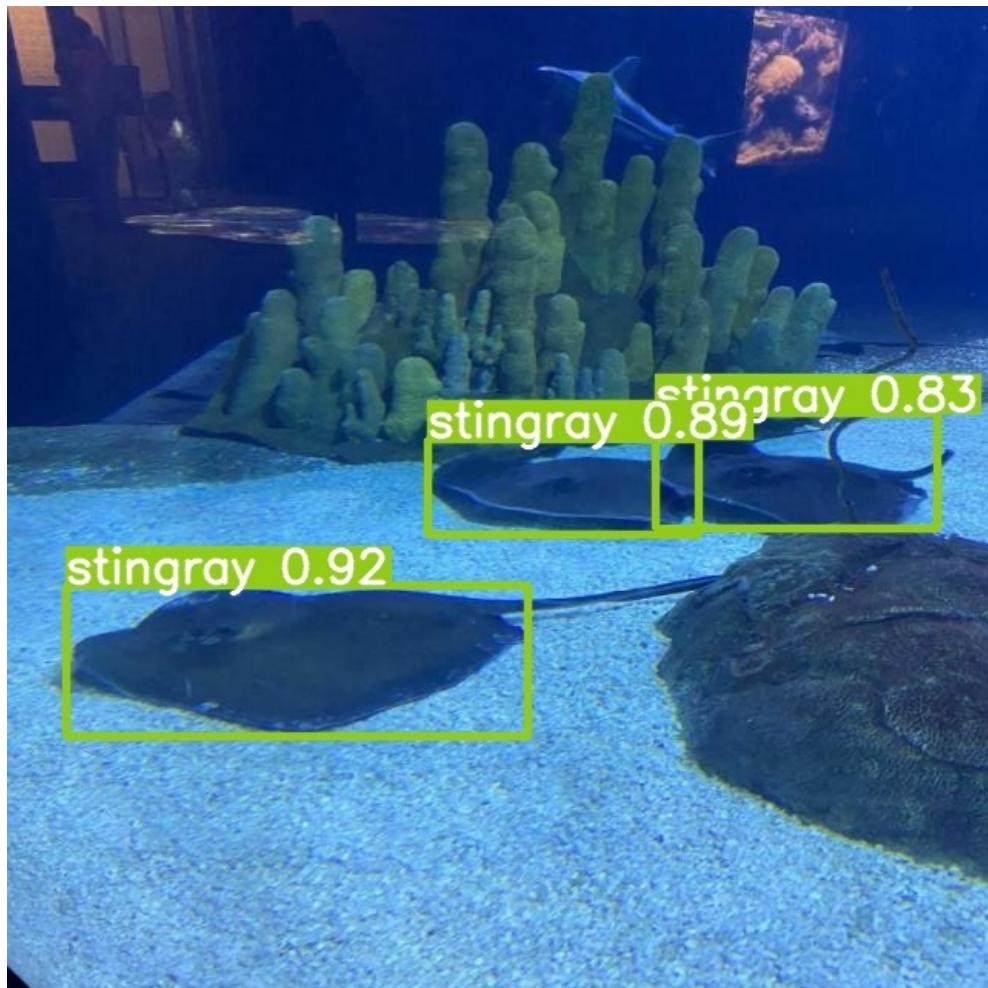


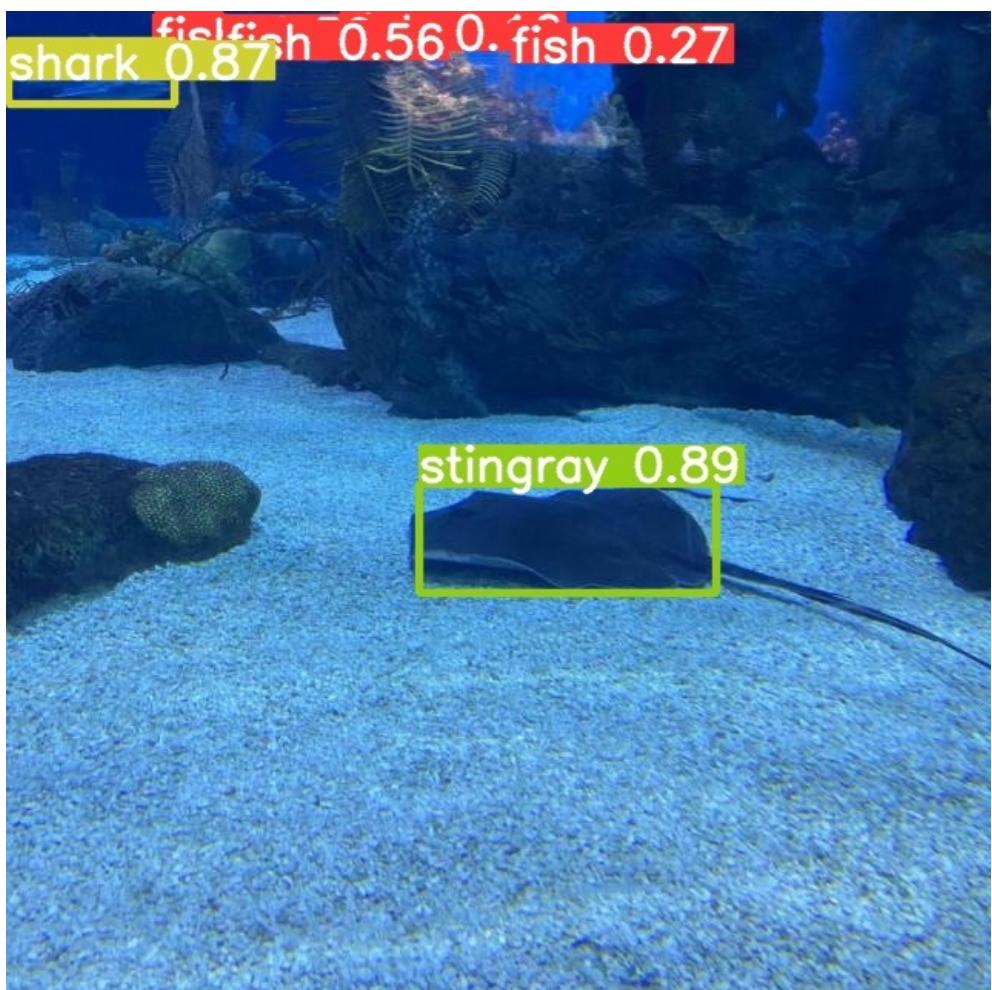
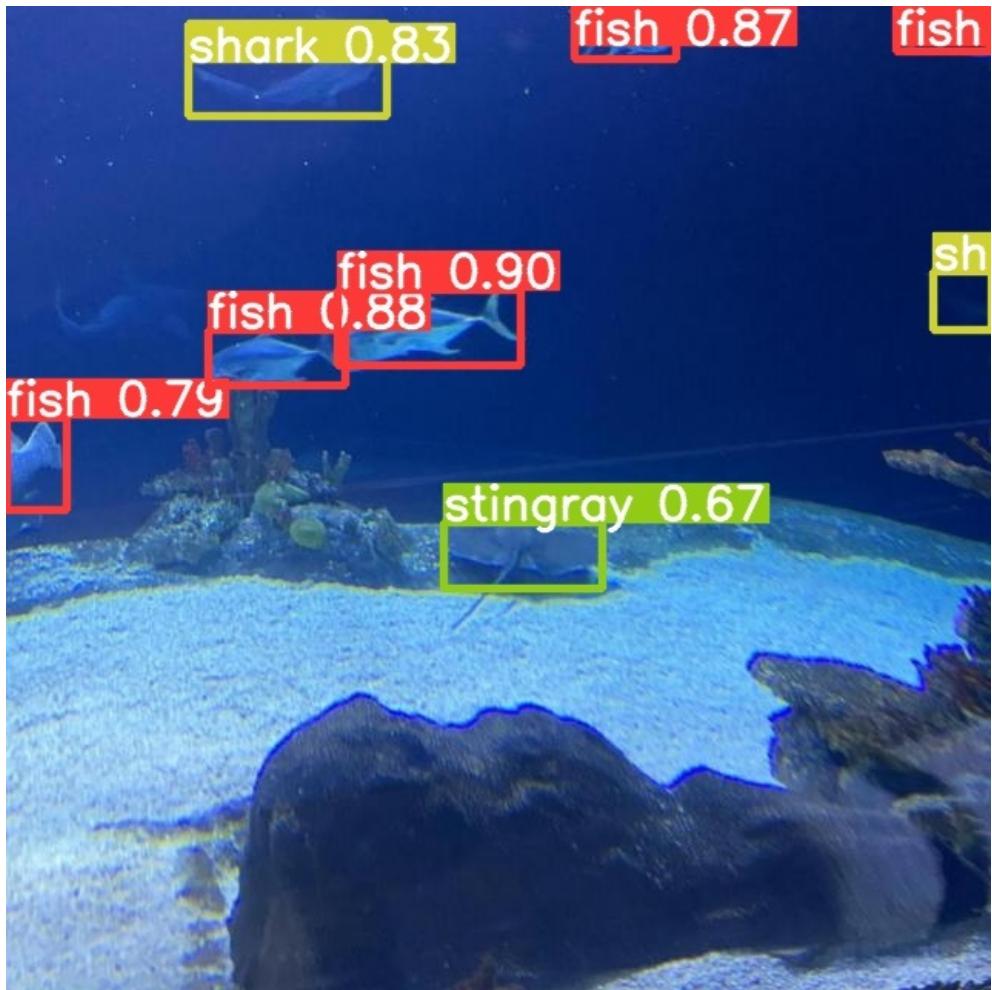


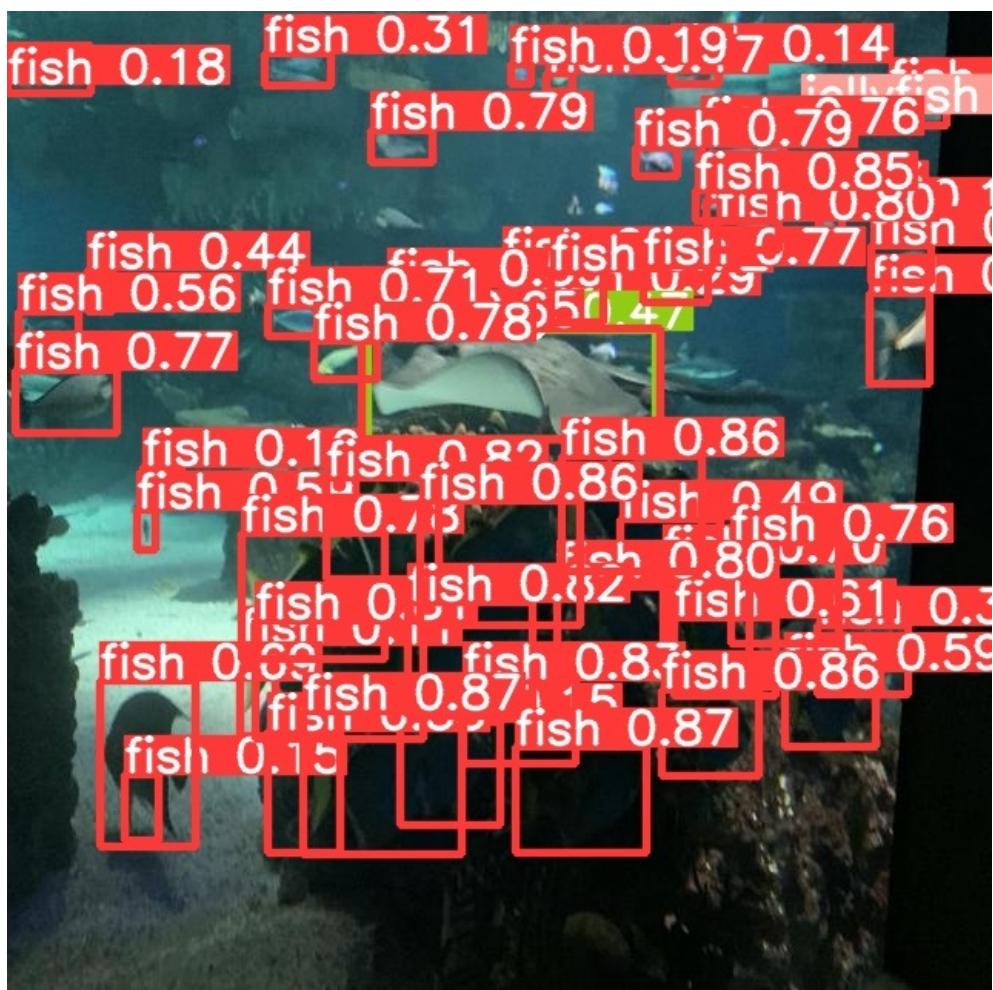
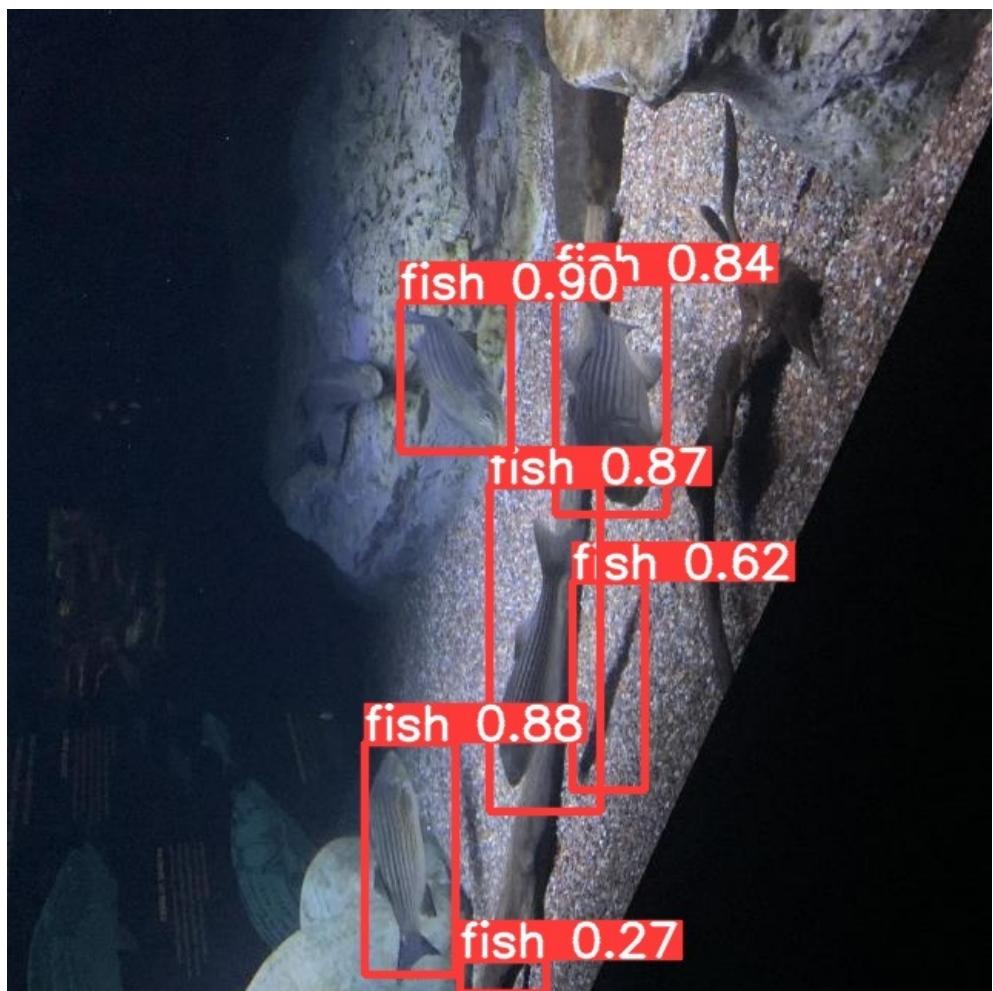


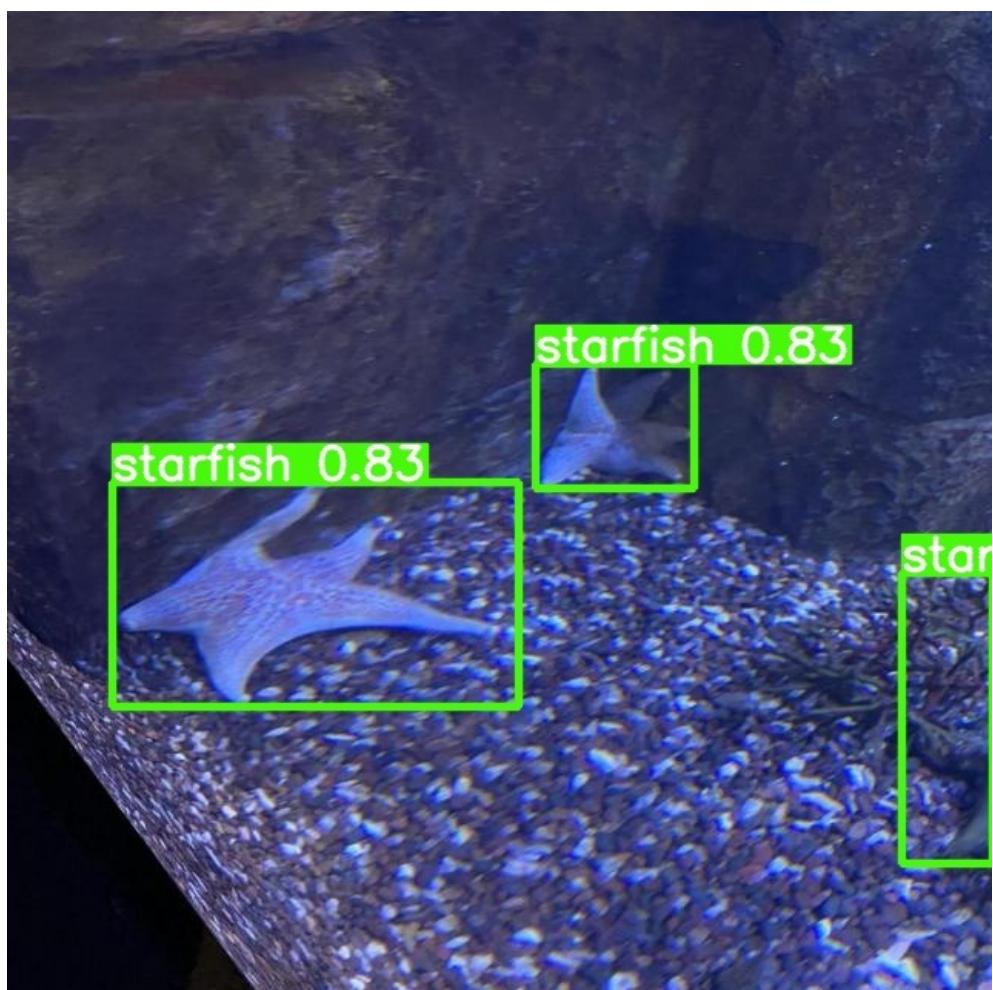
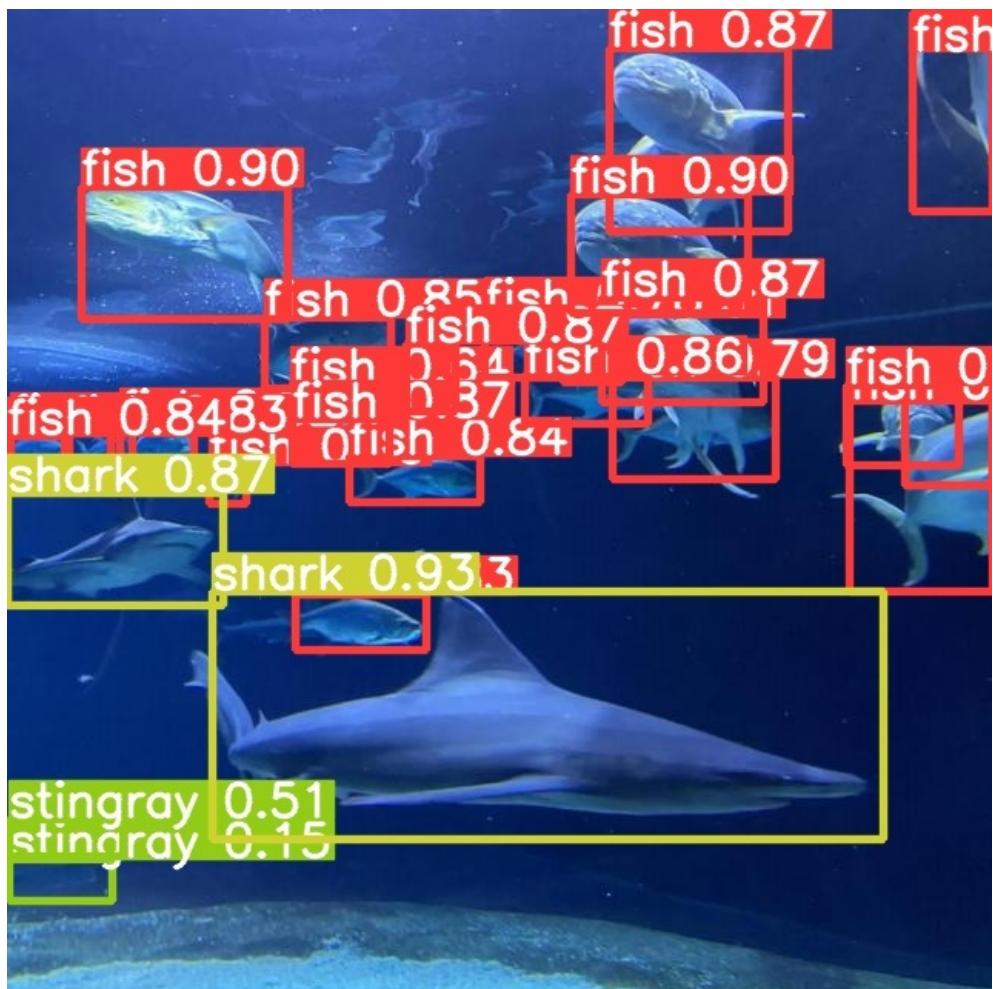


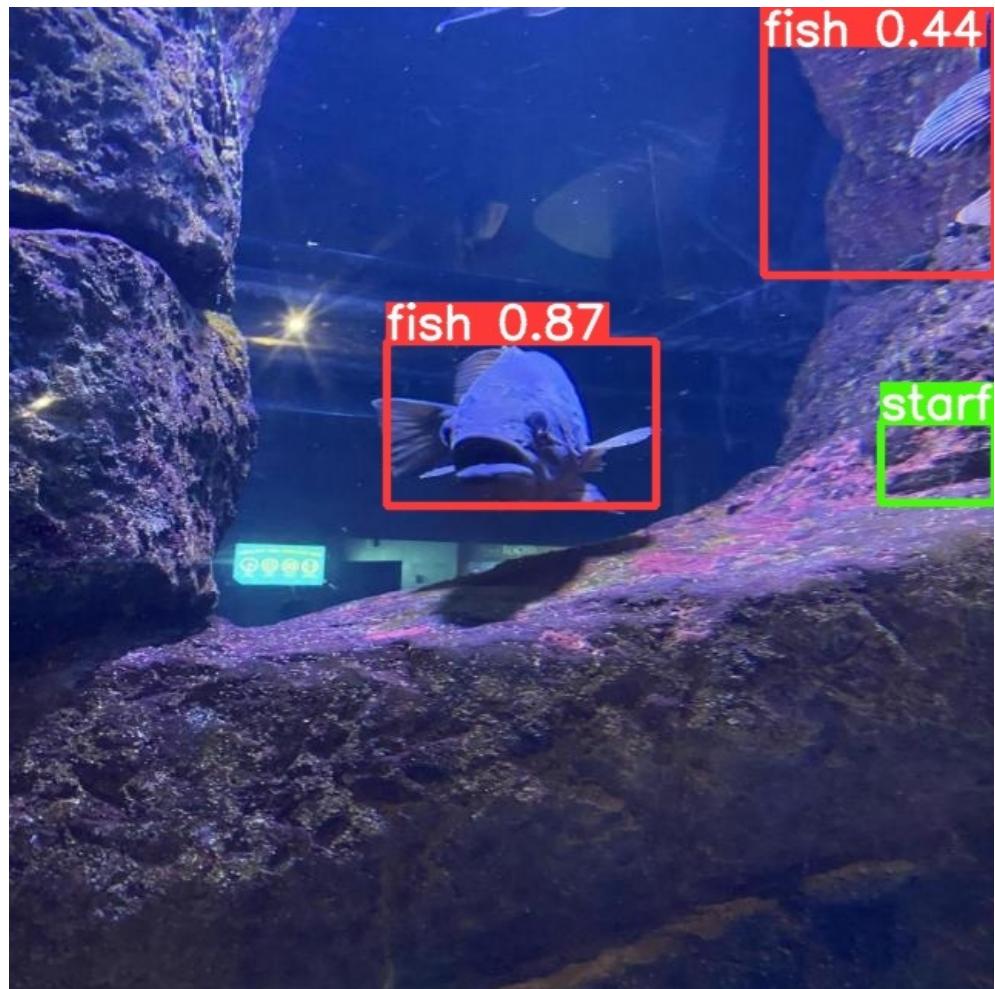
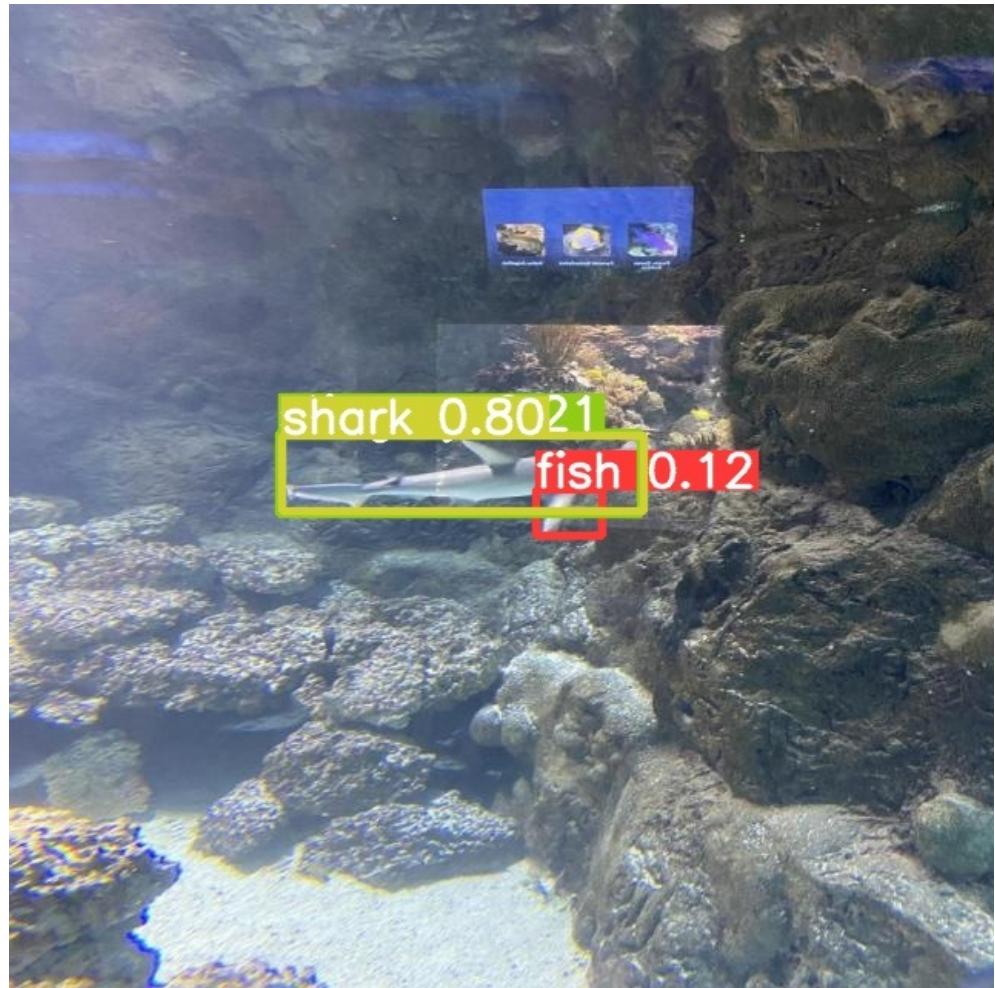


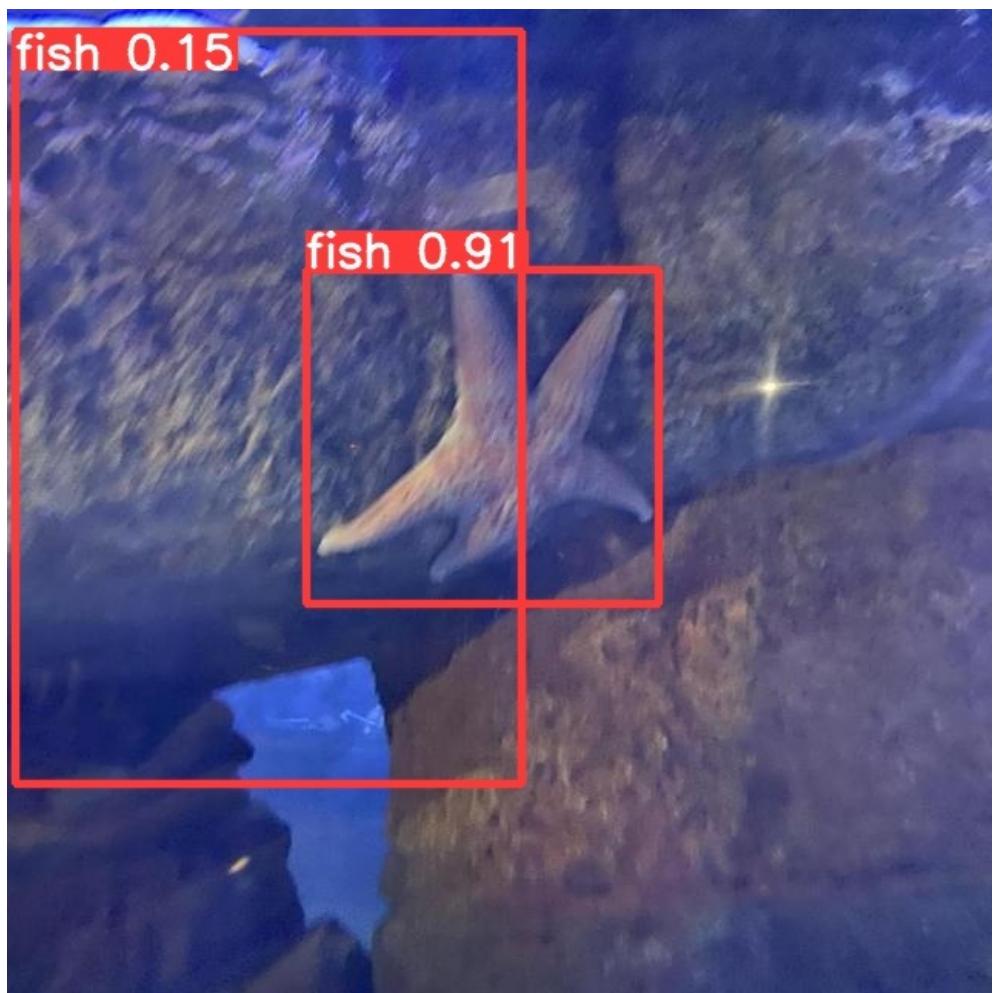


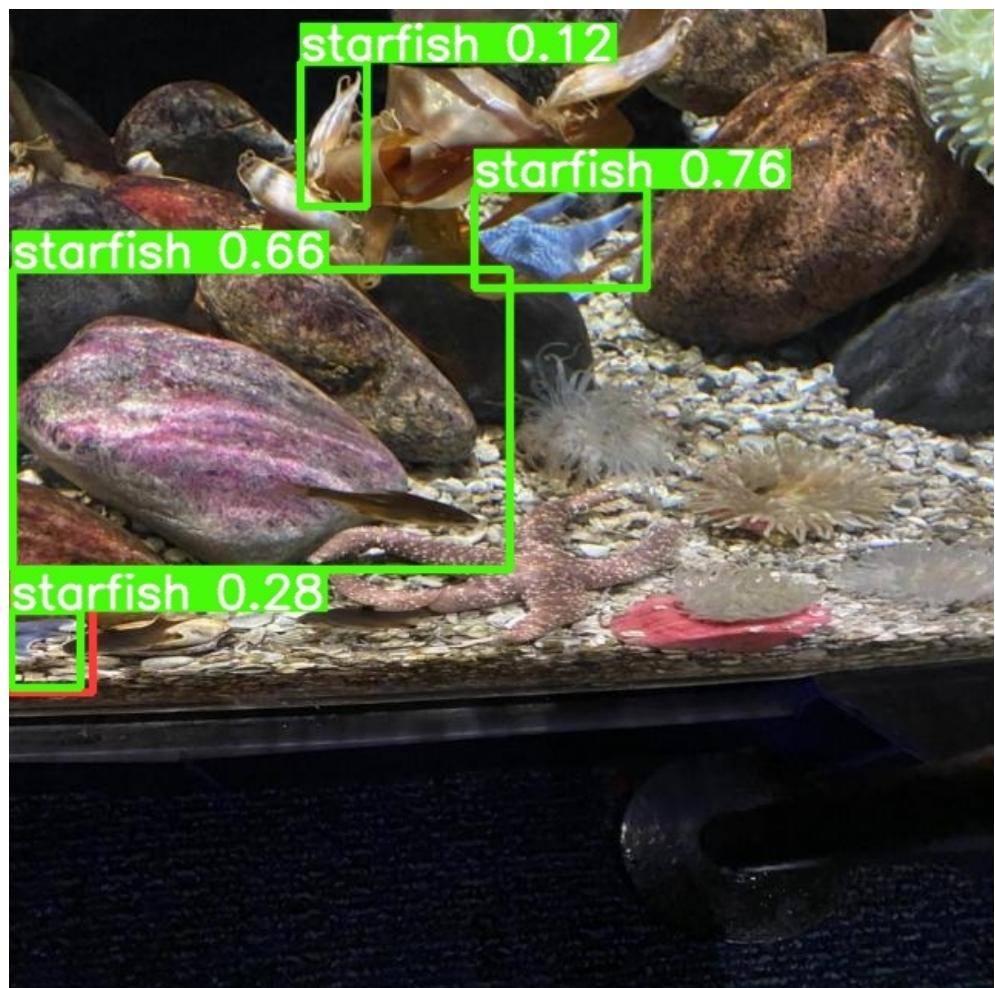
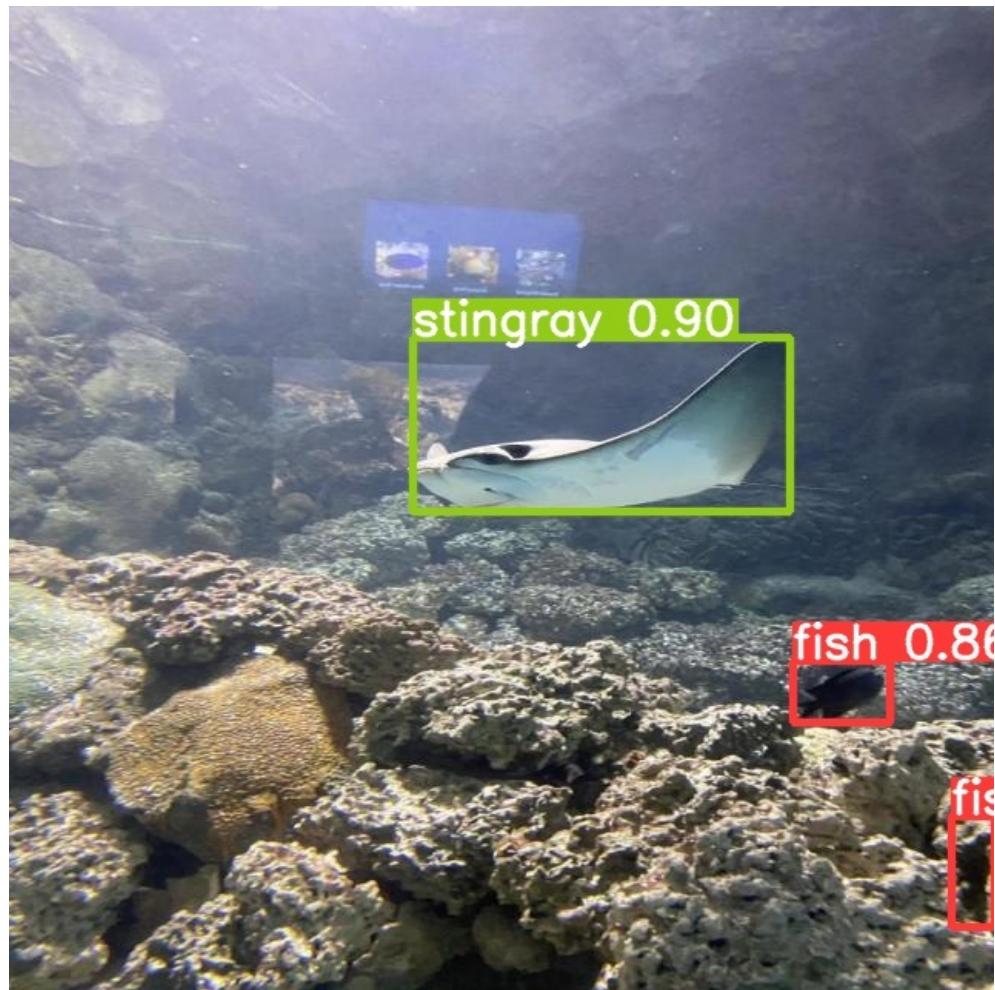


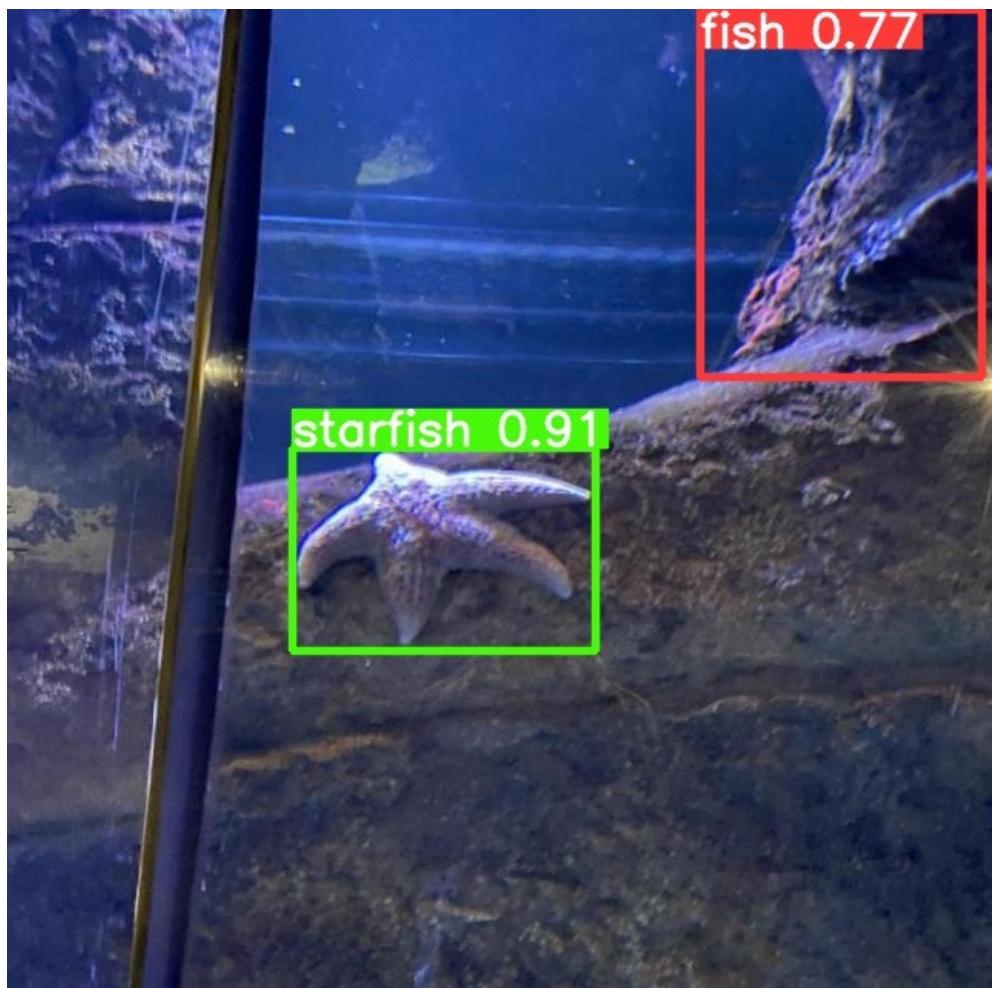
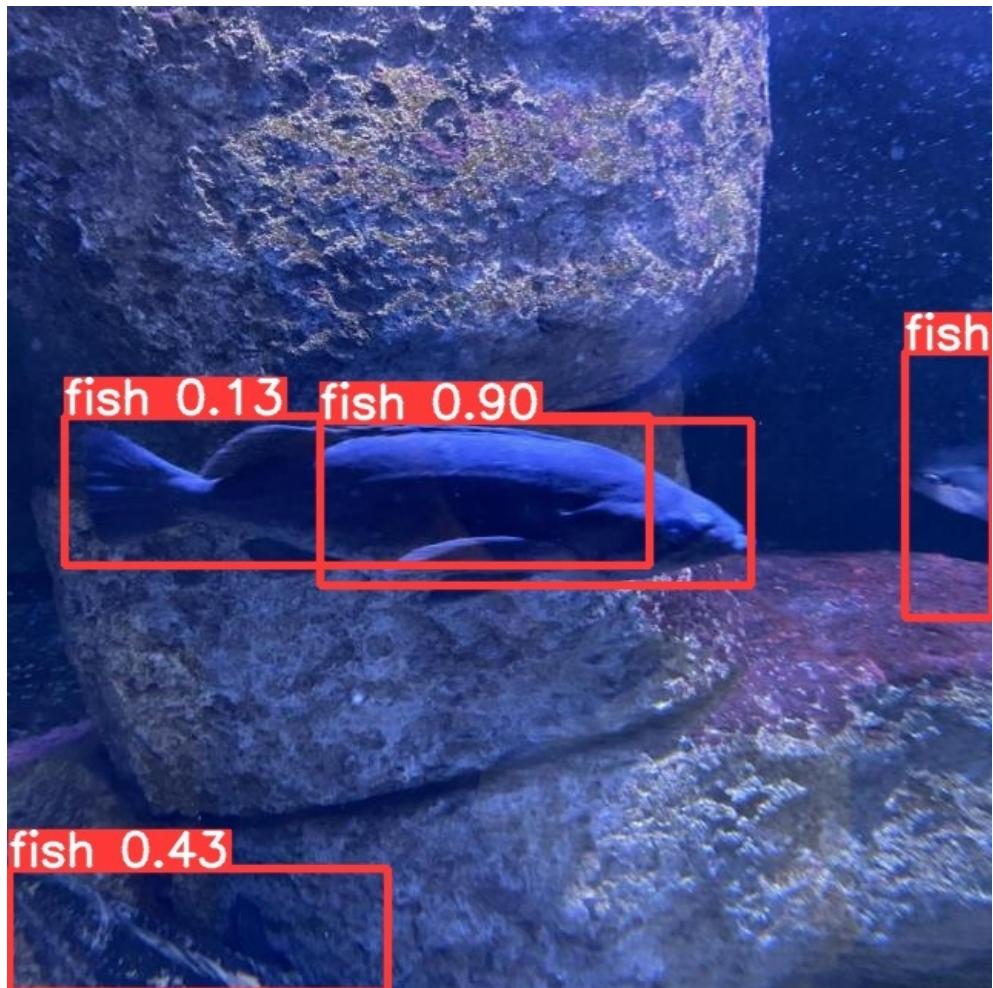


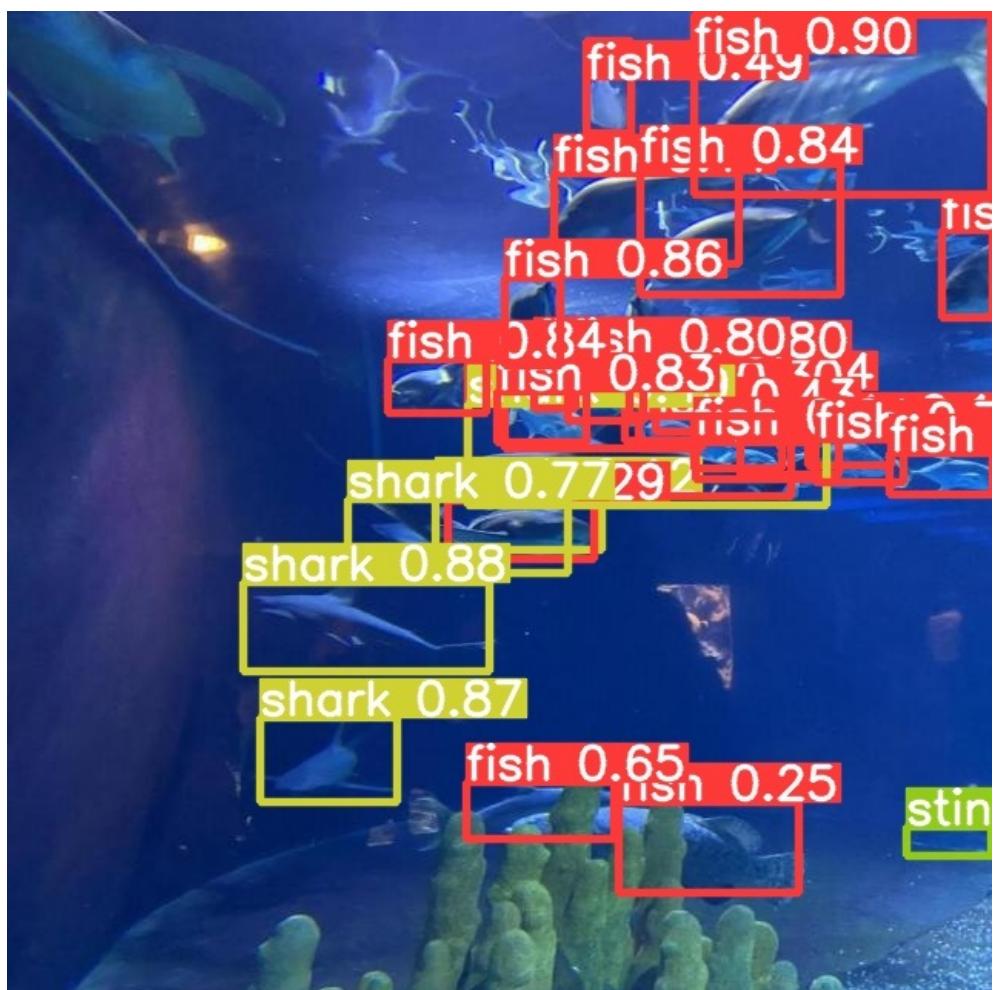
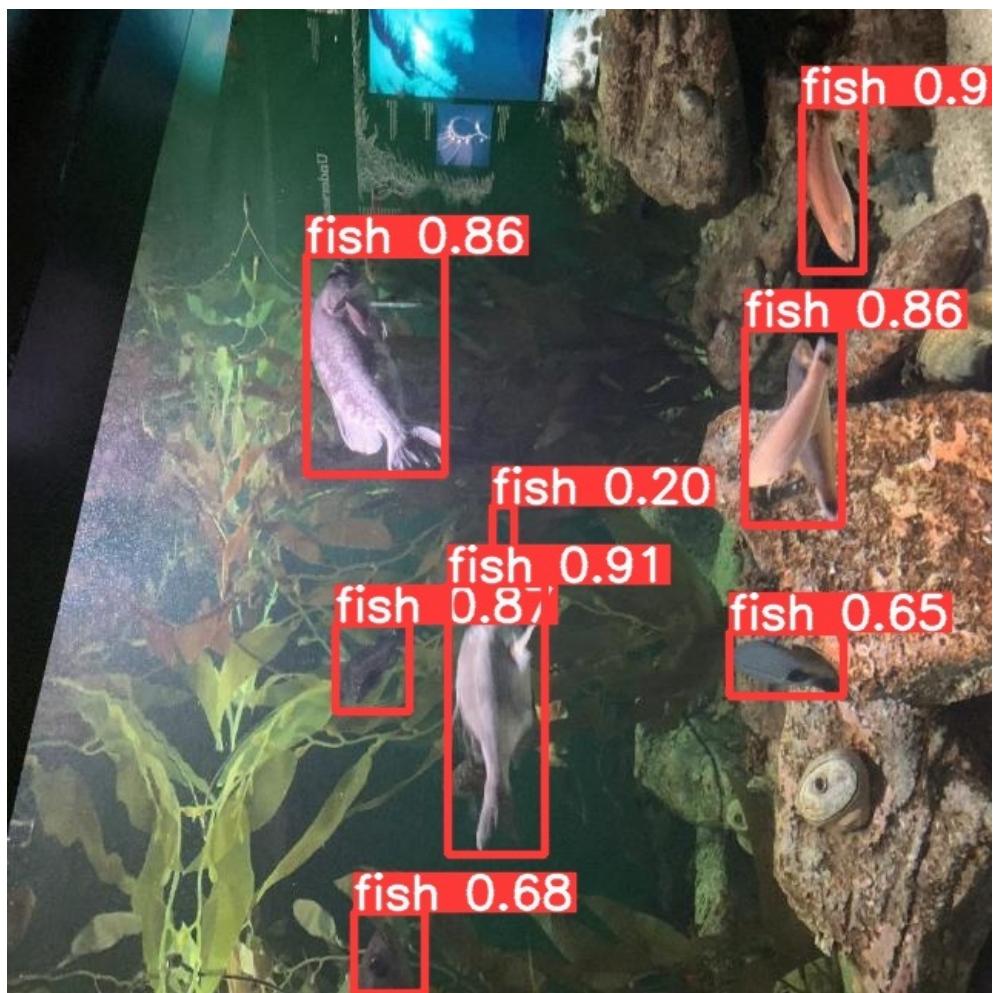


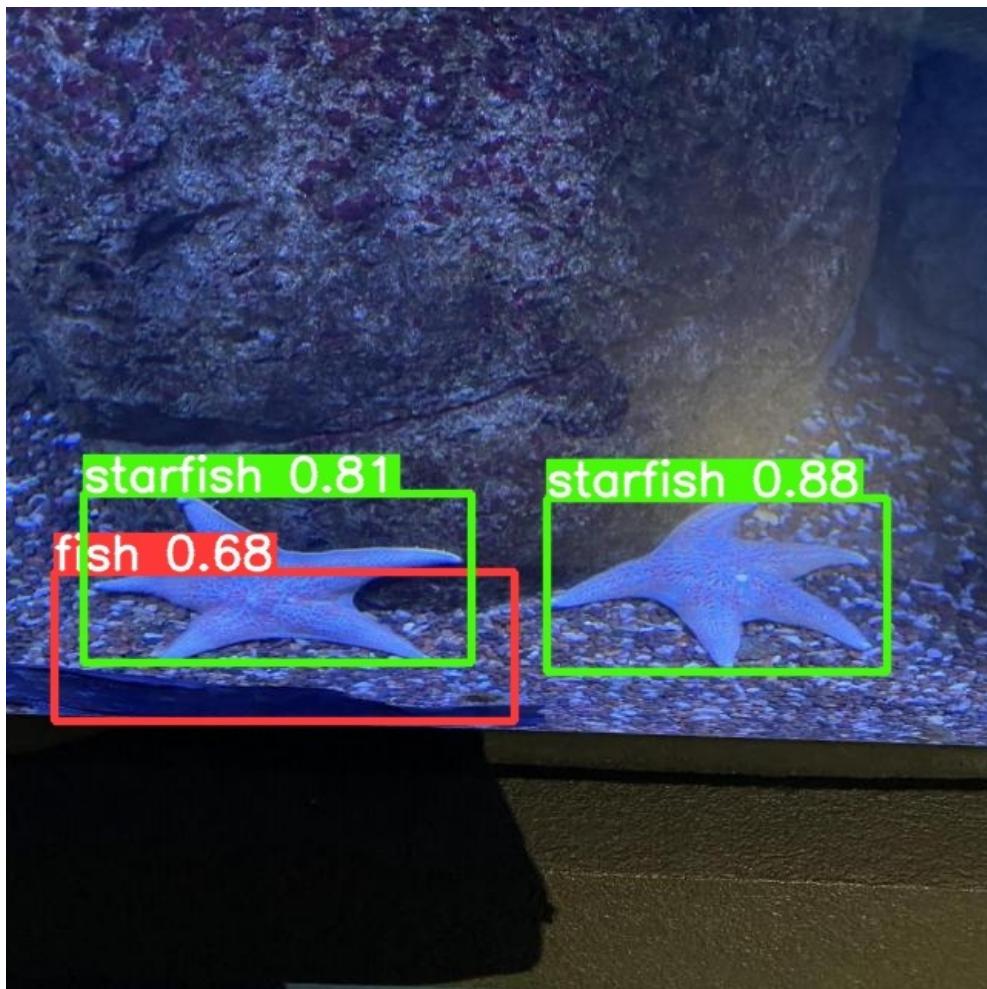
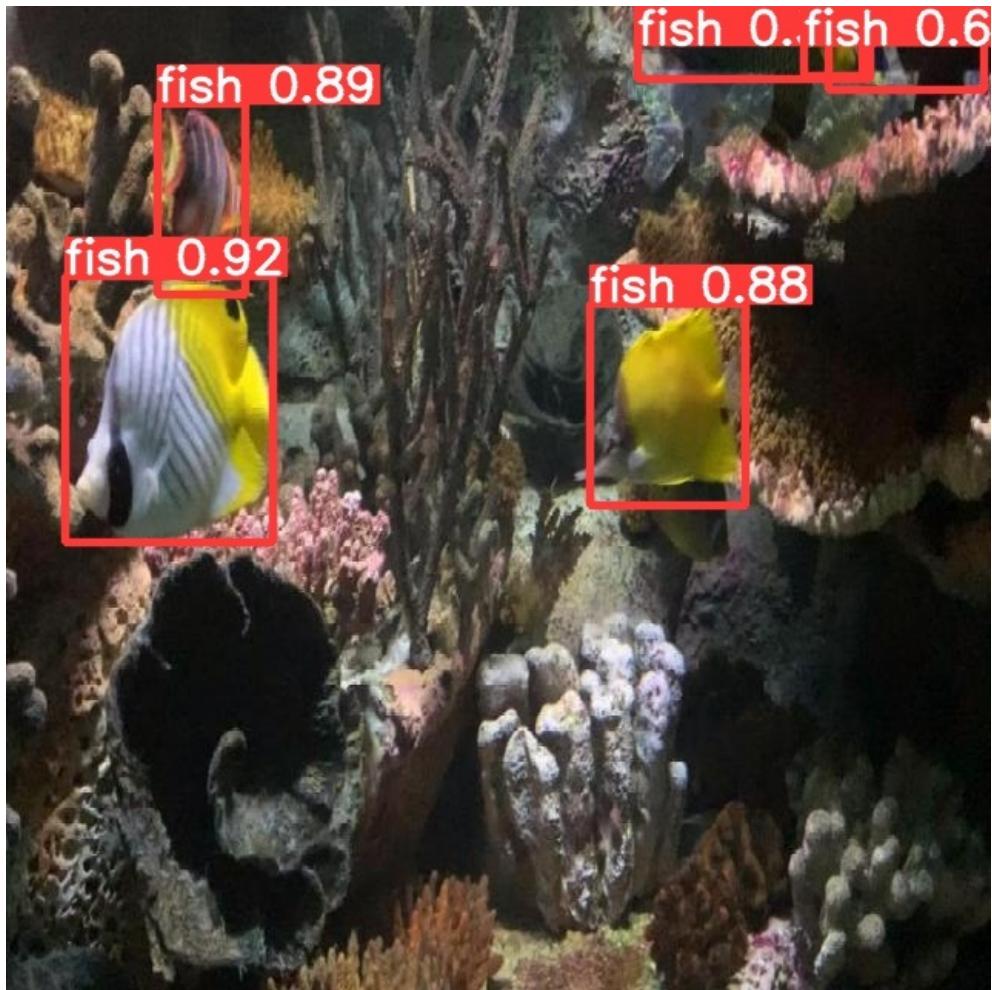


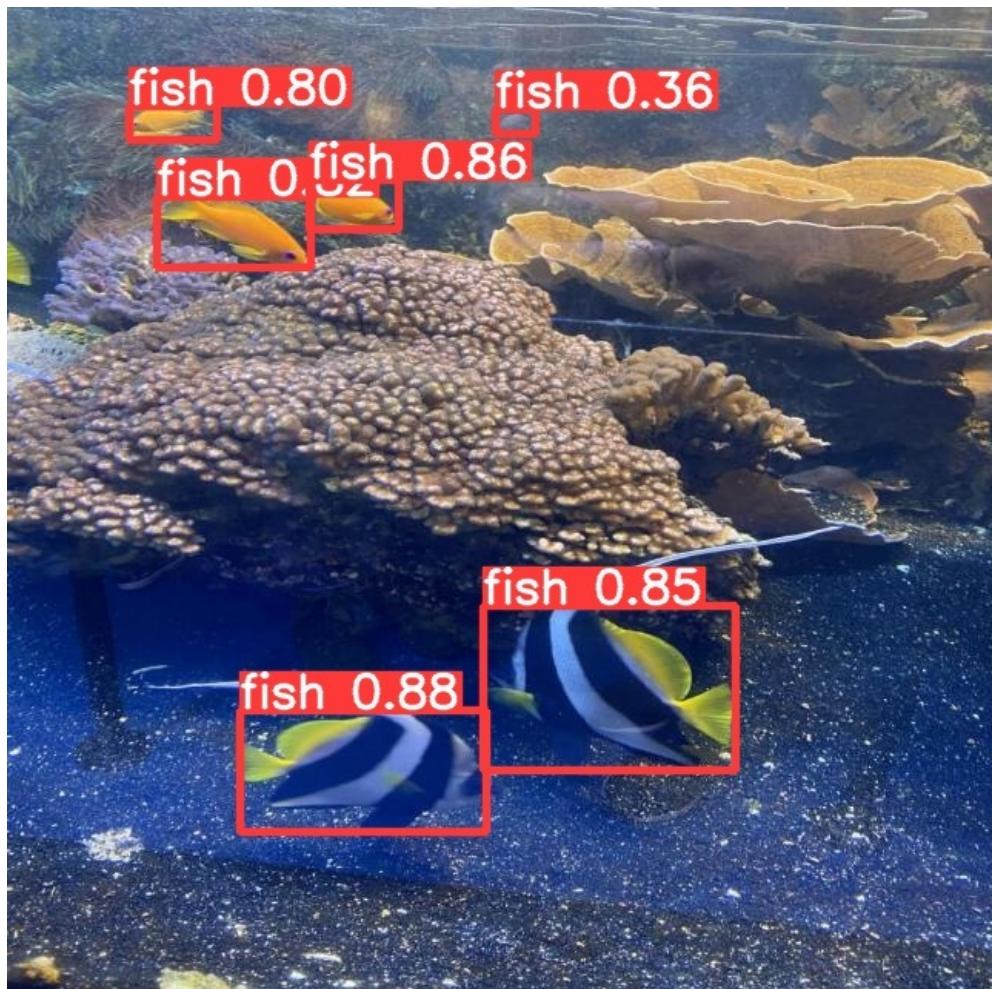
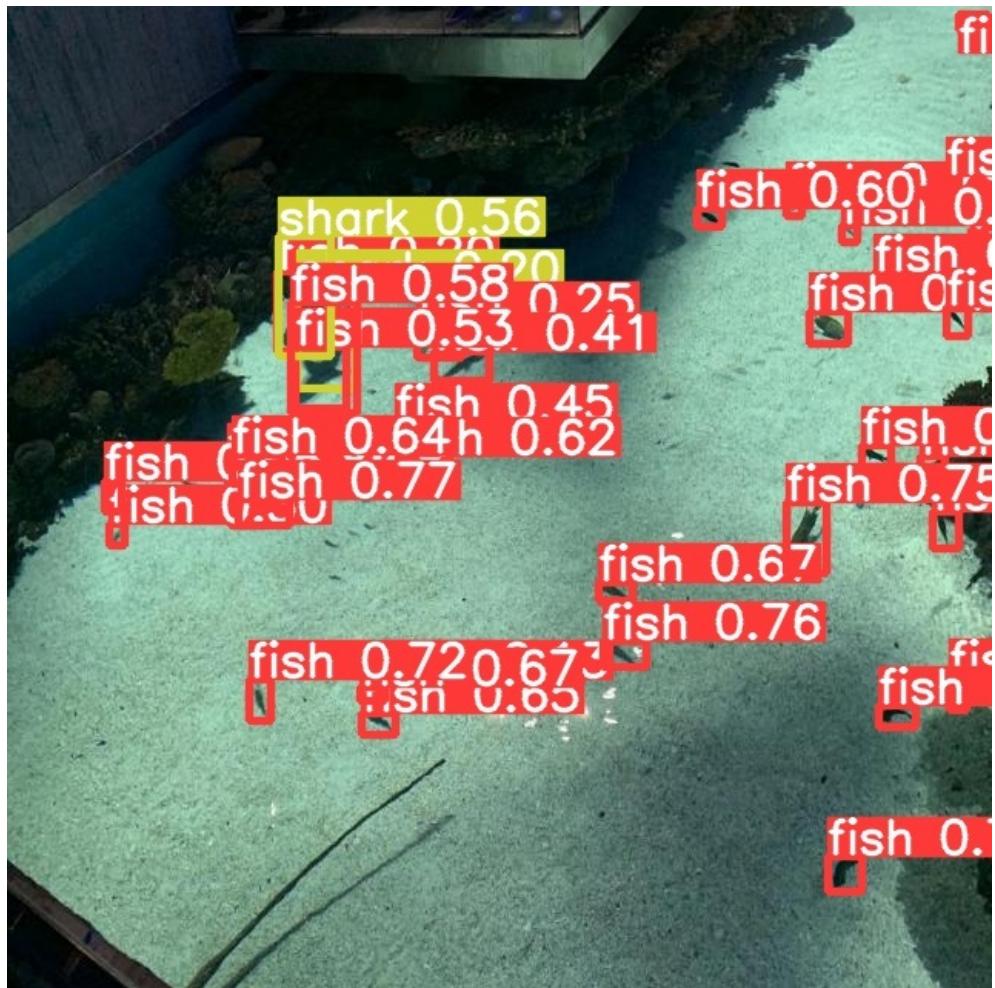


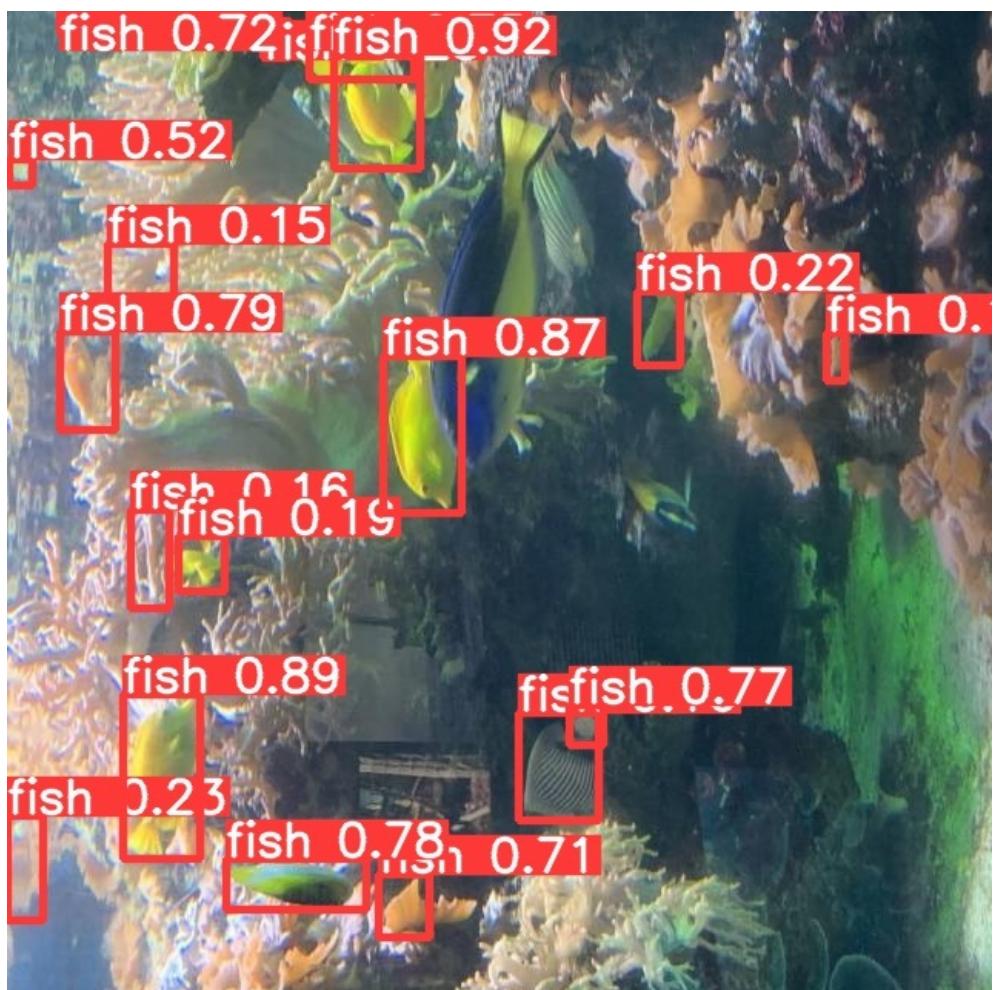


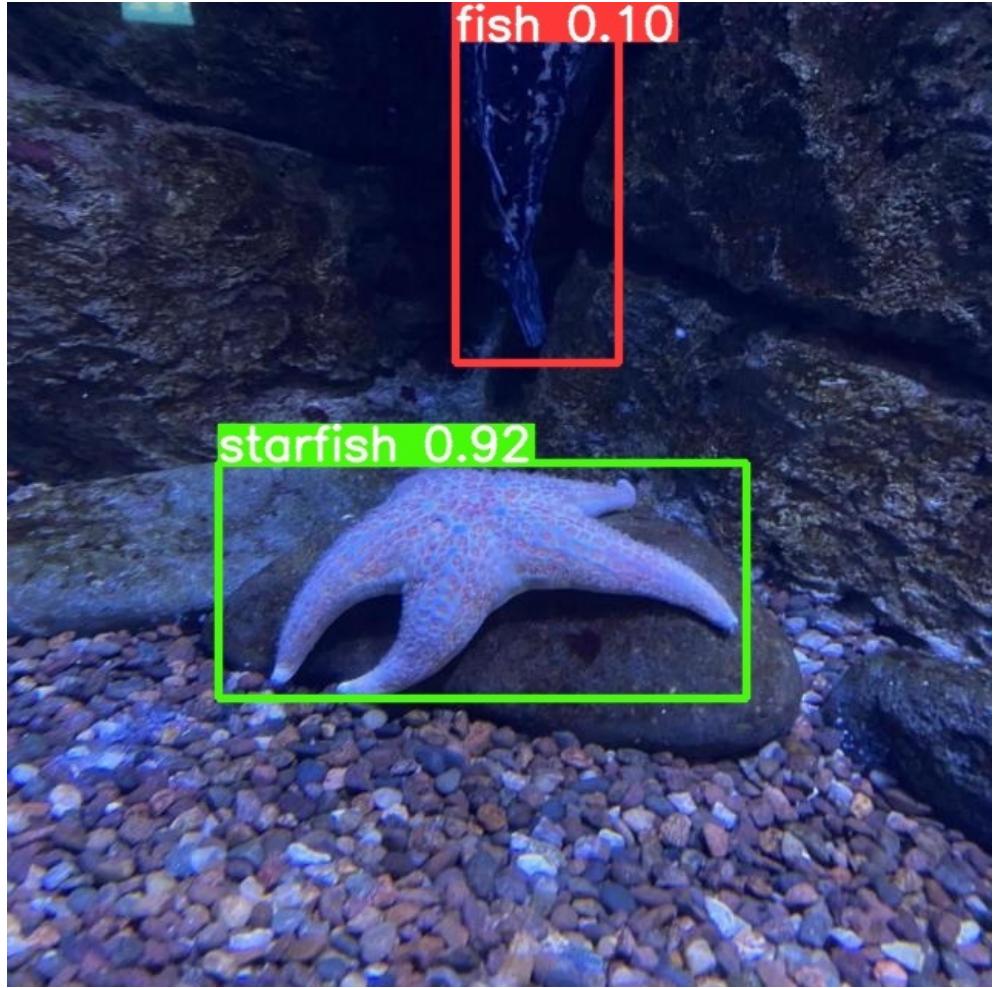




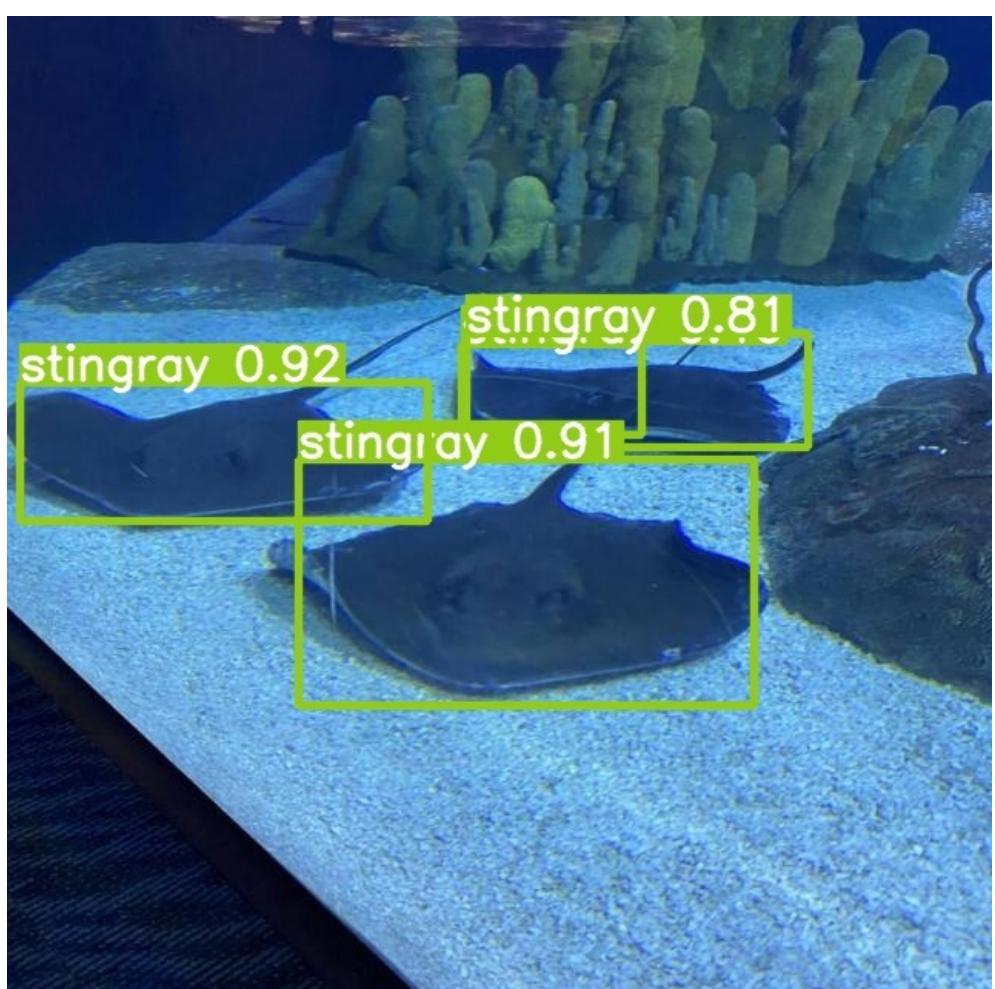




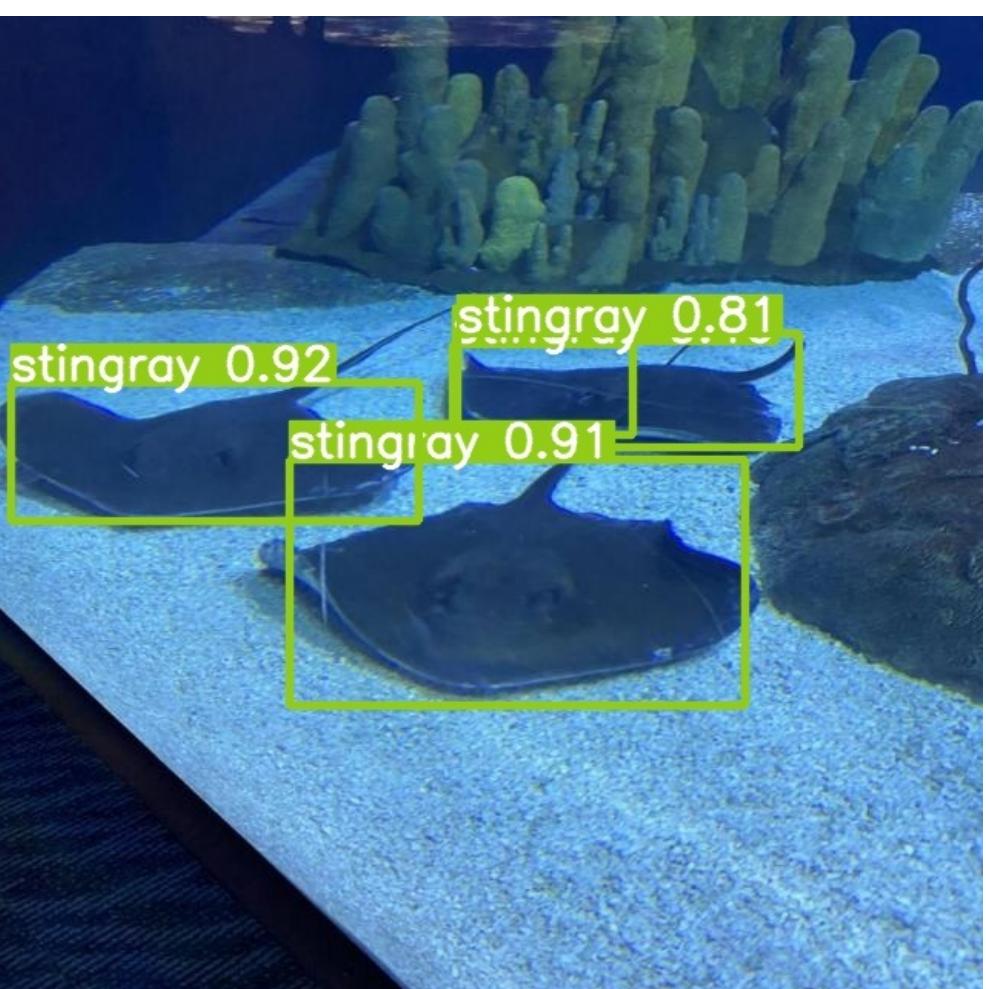


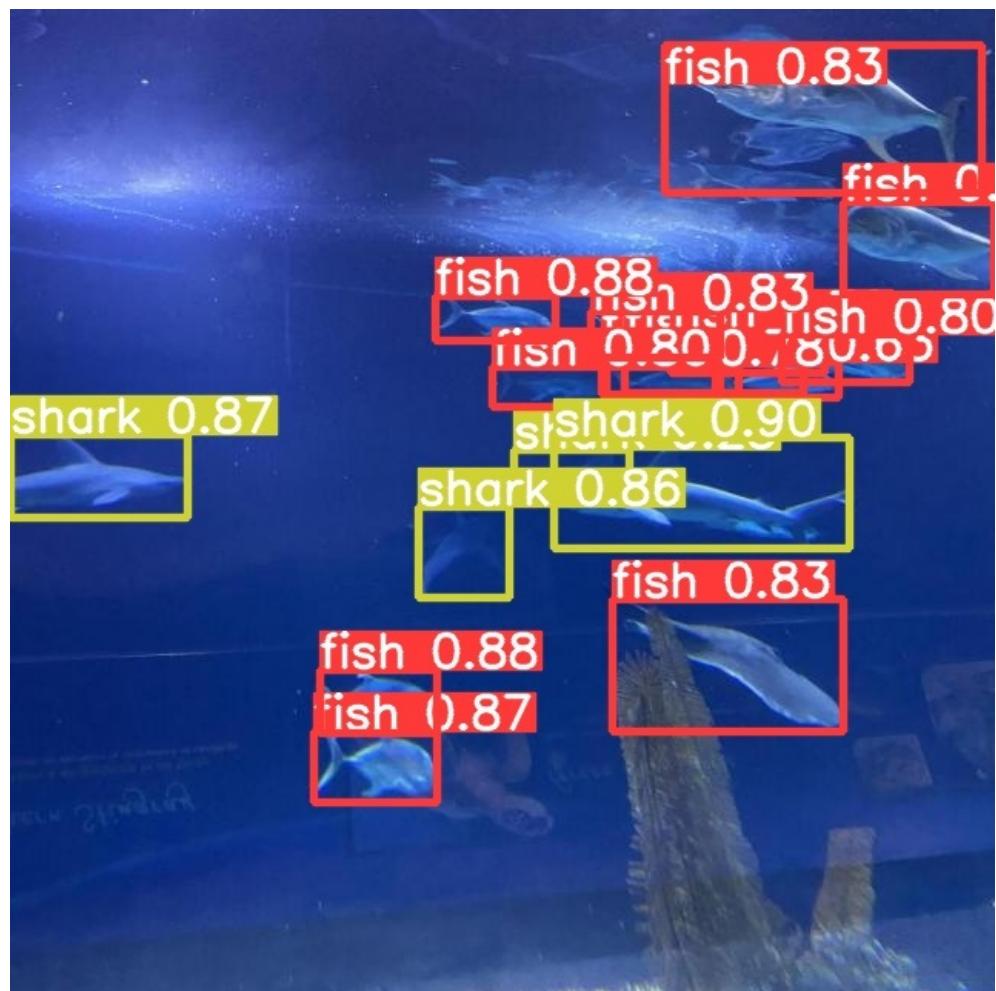


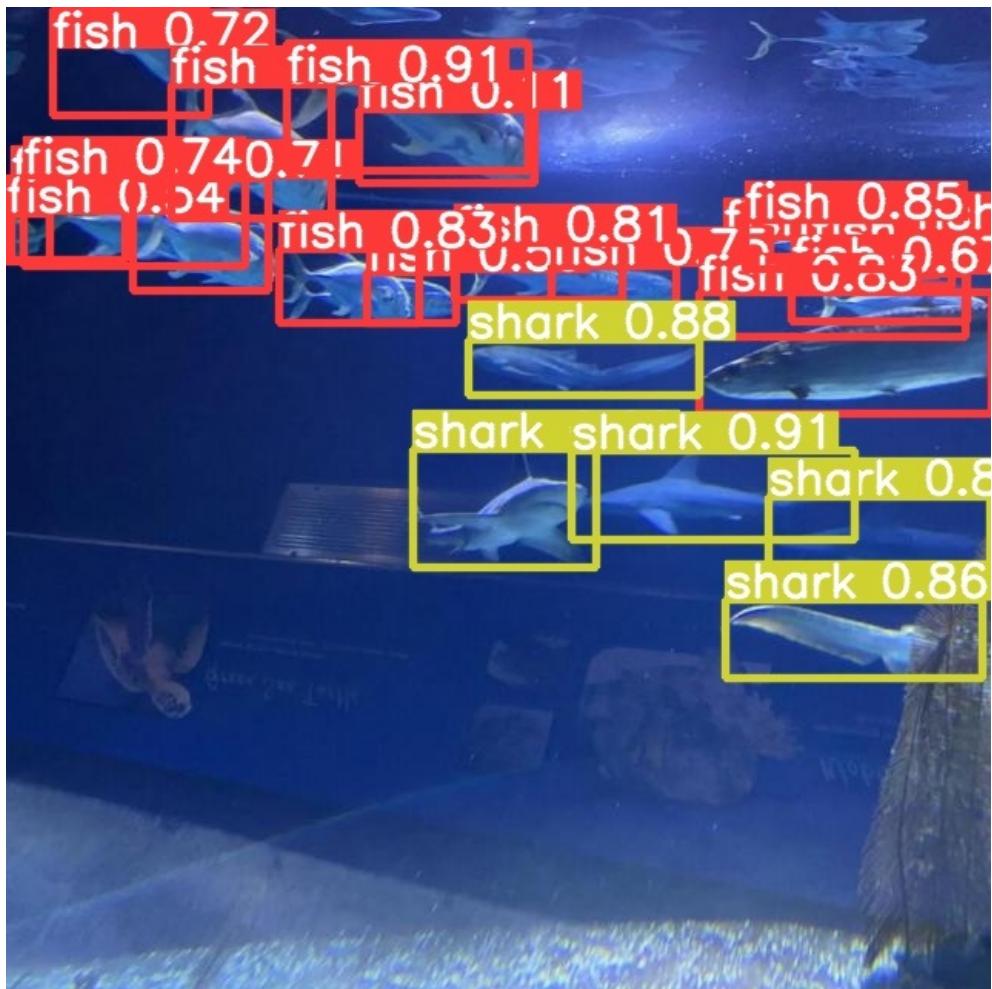
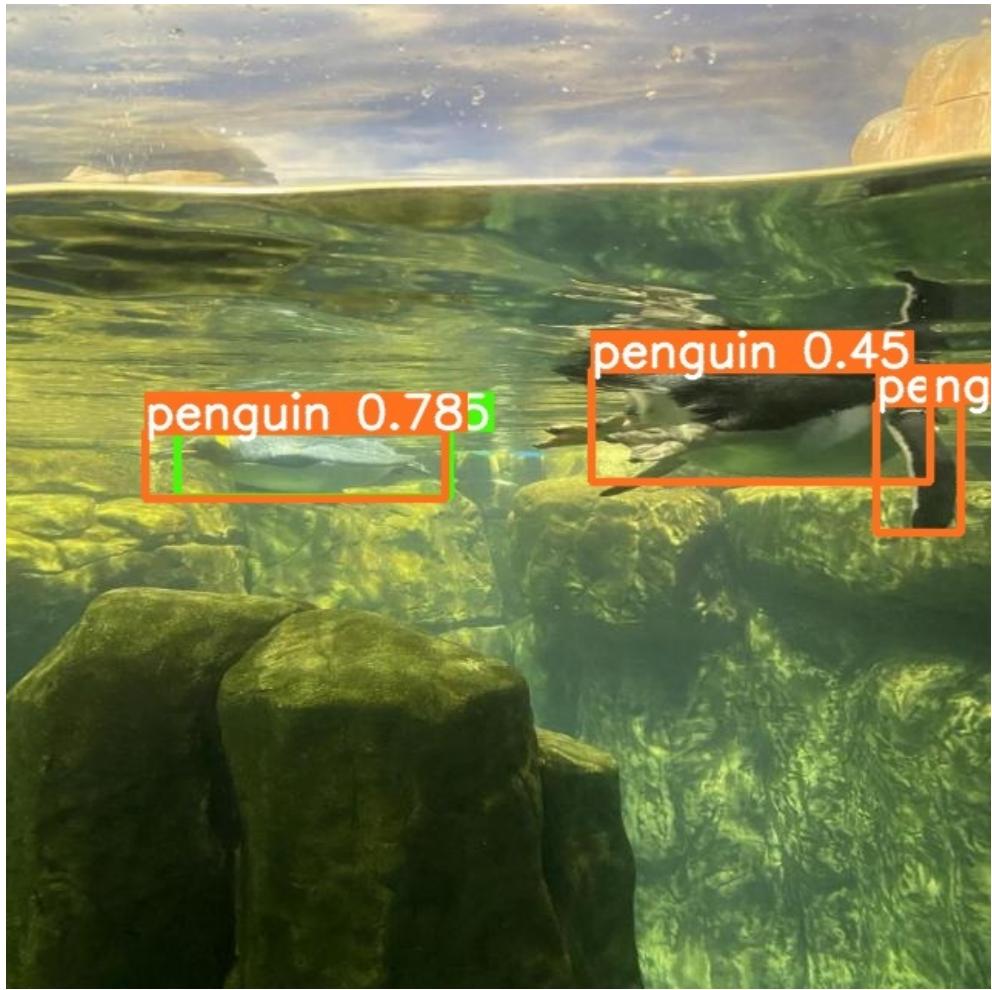
fish 0.10

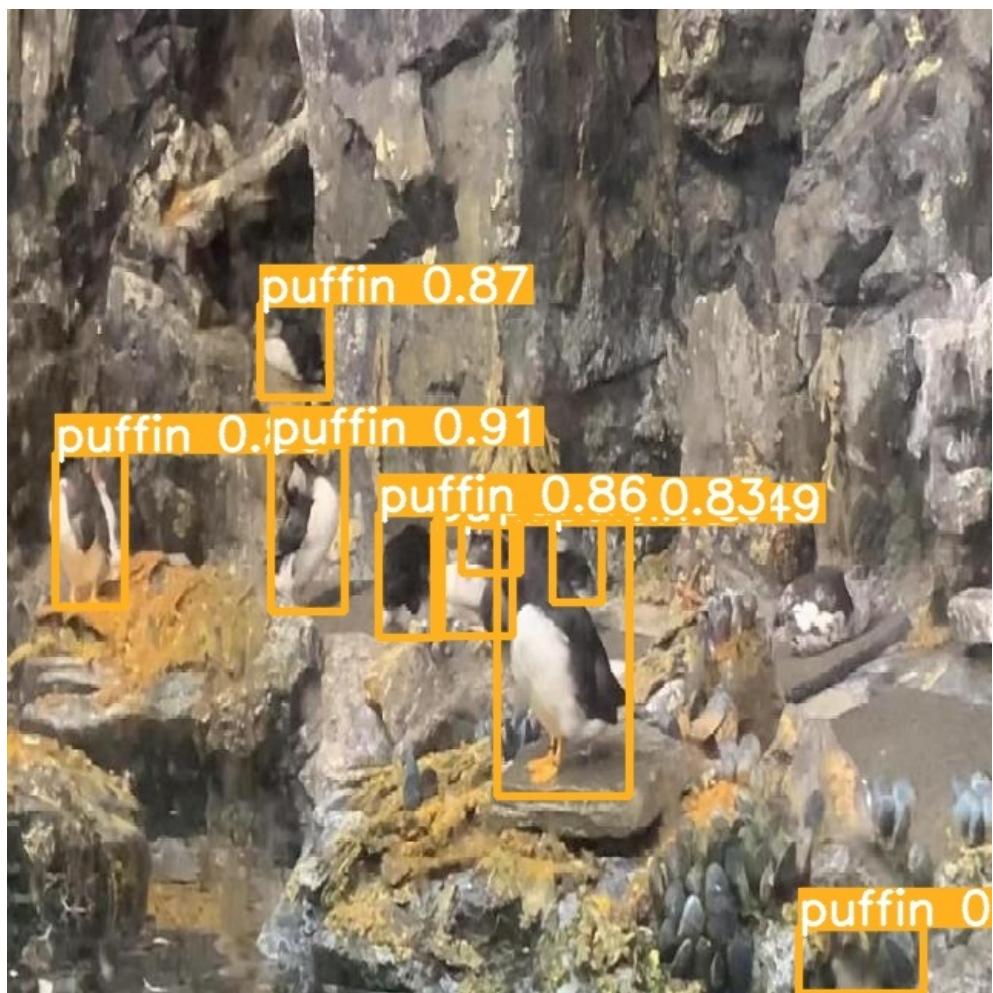


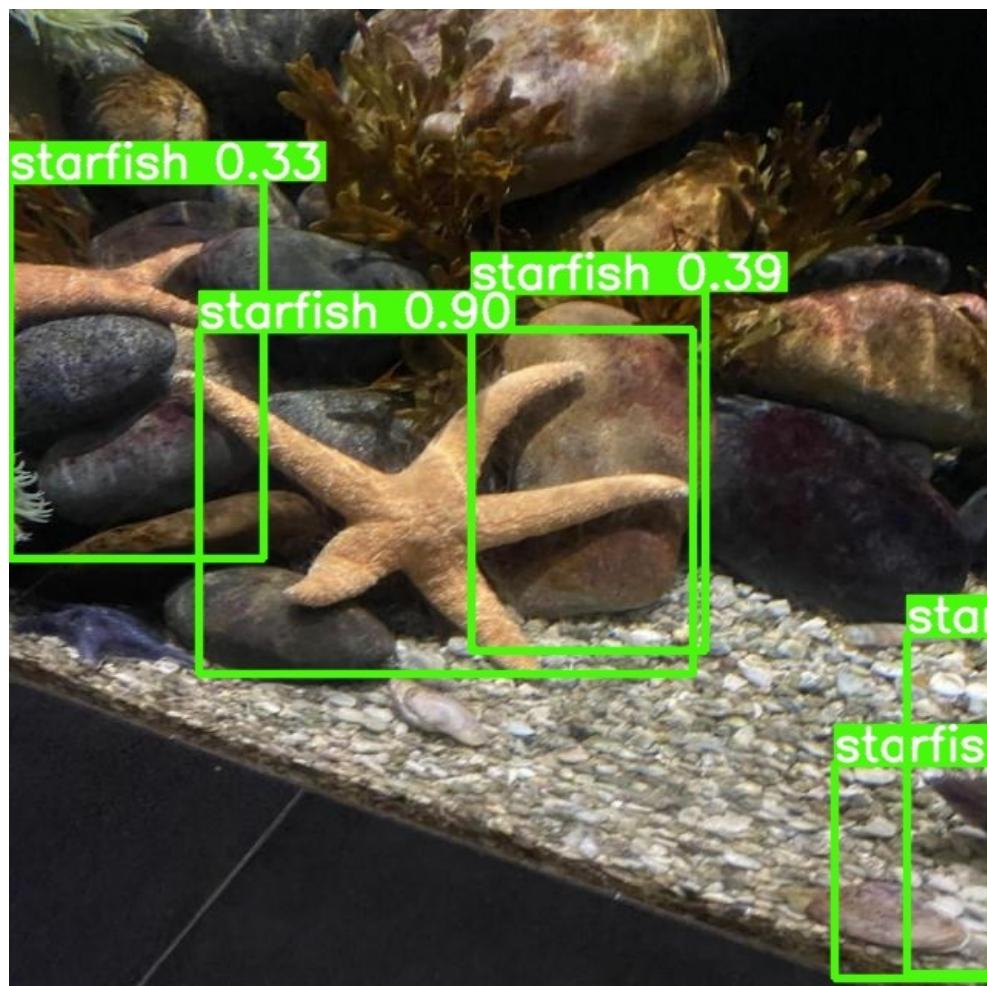
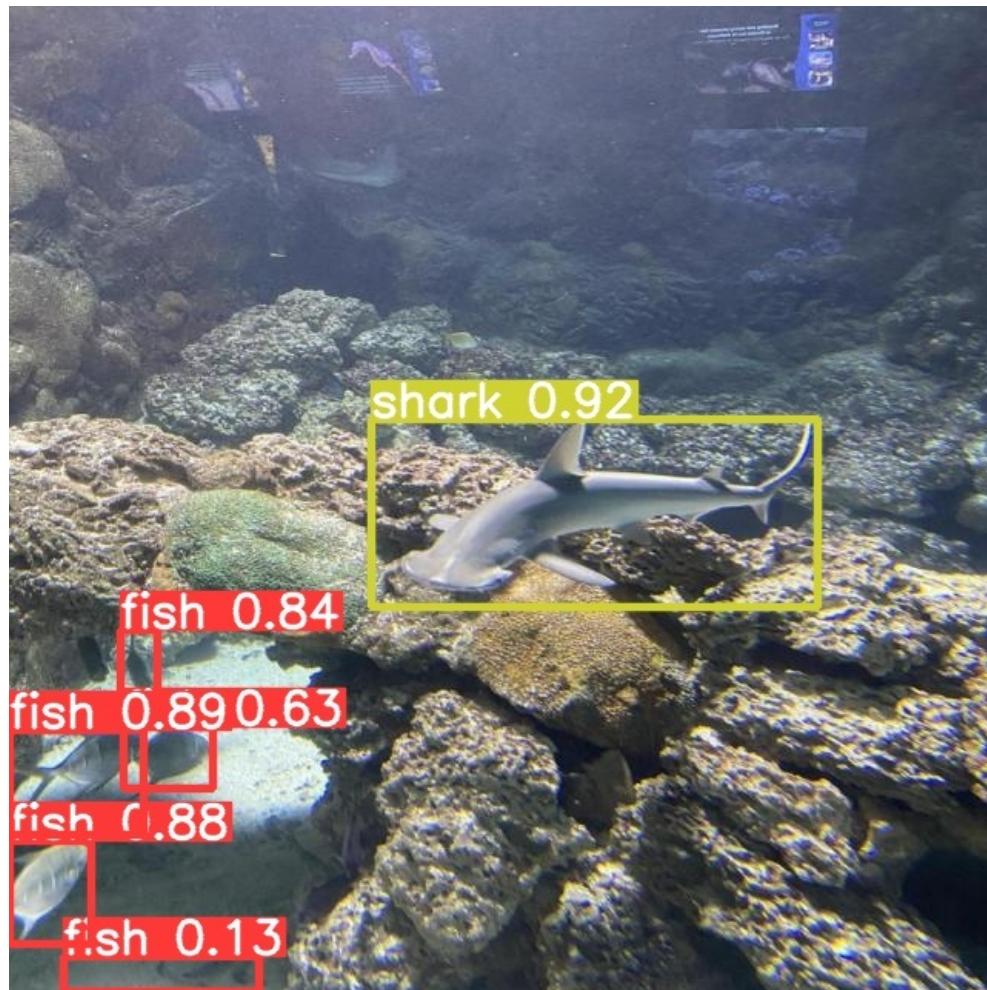
starfish 0.92

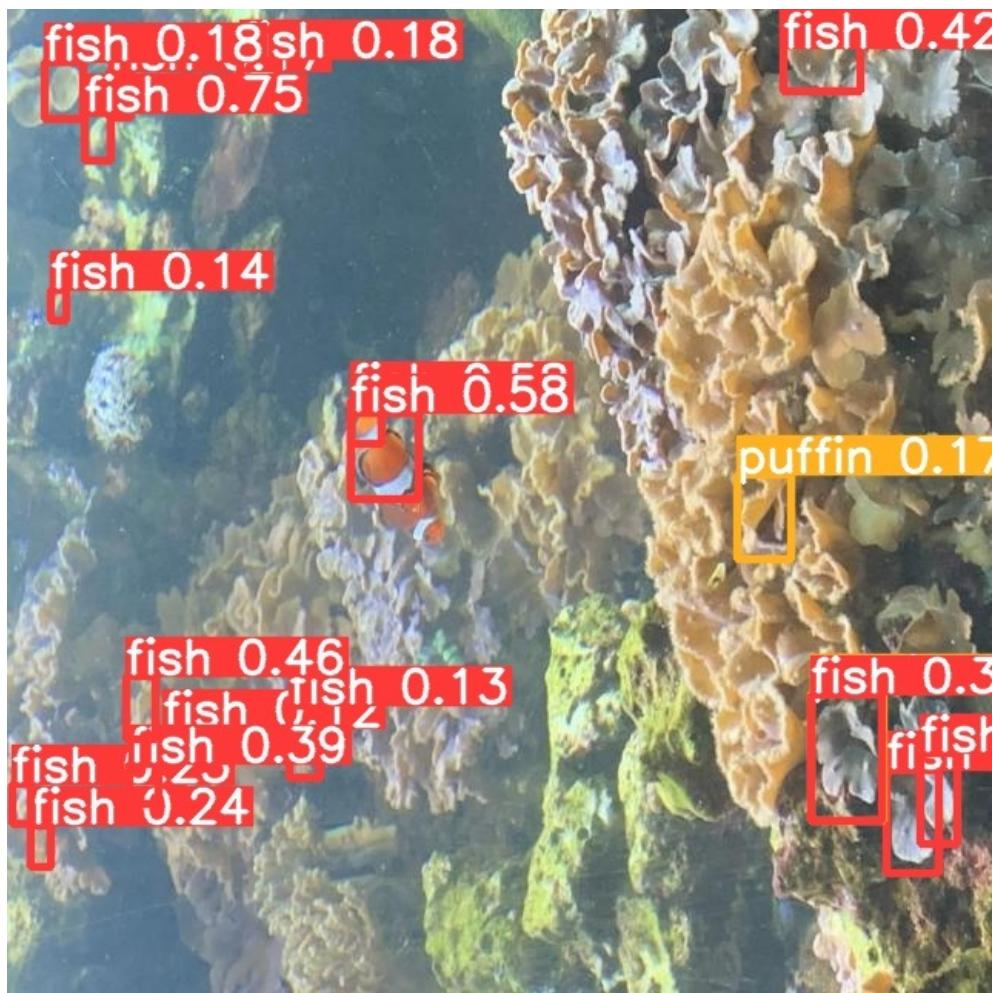


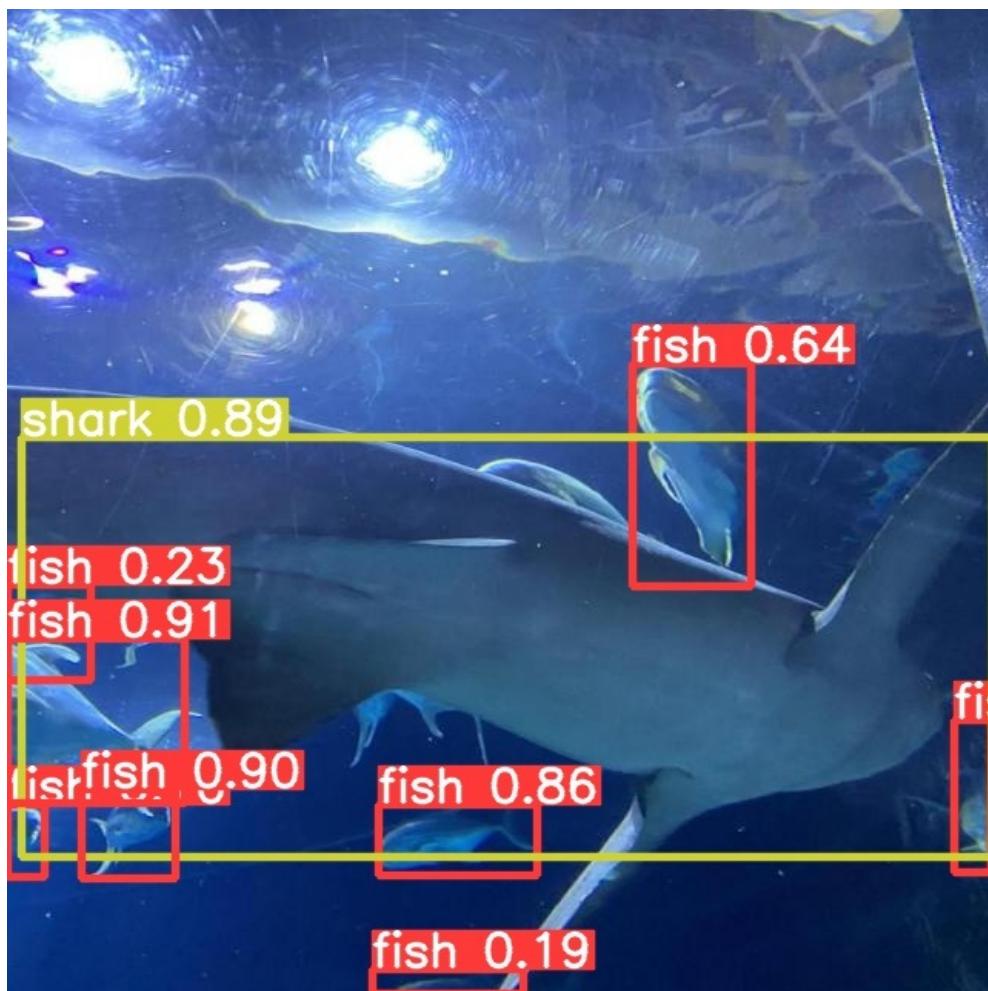
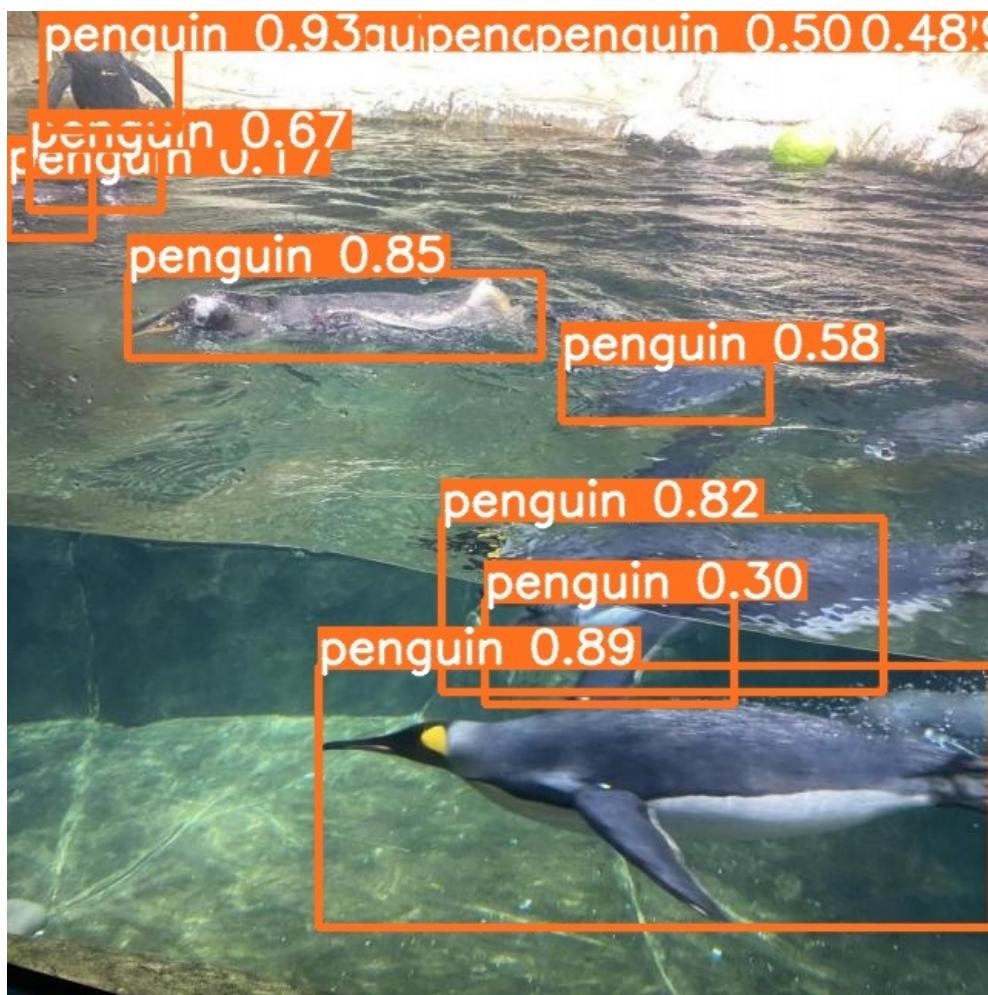


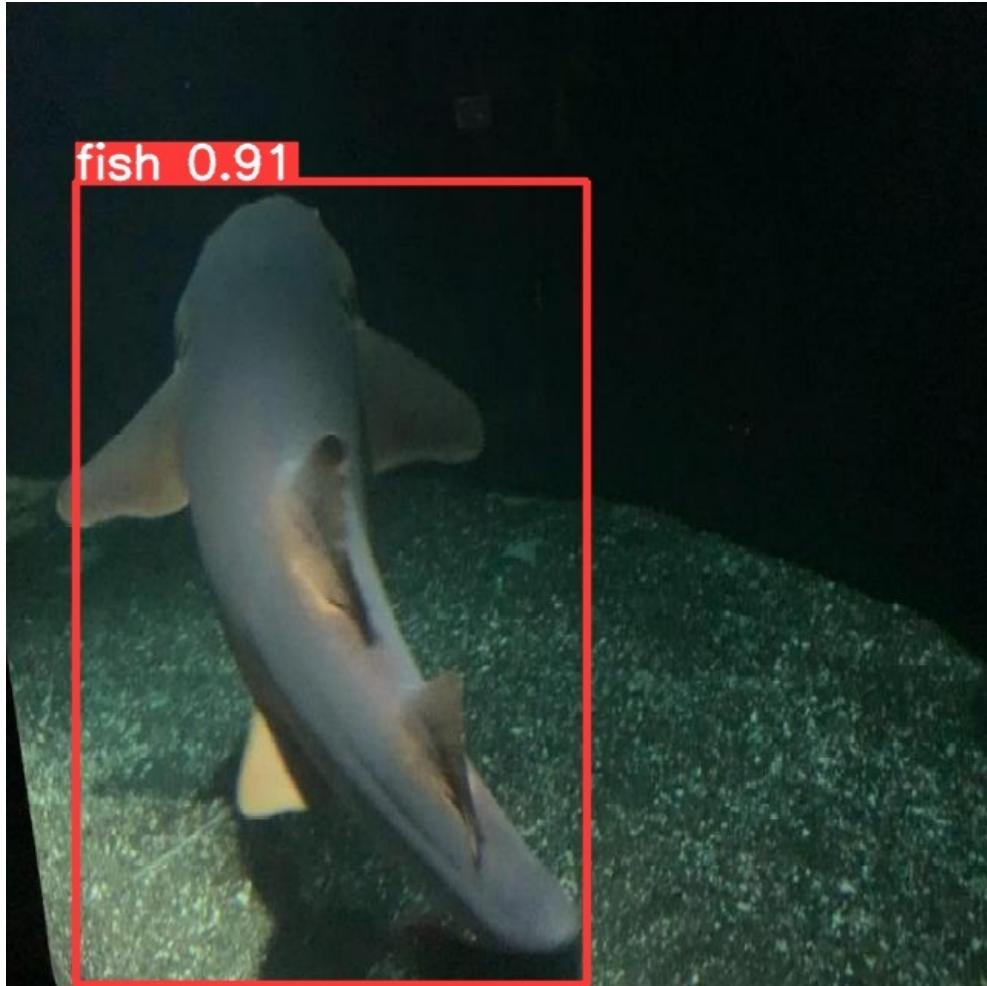








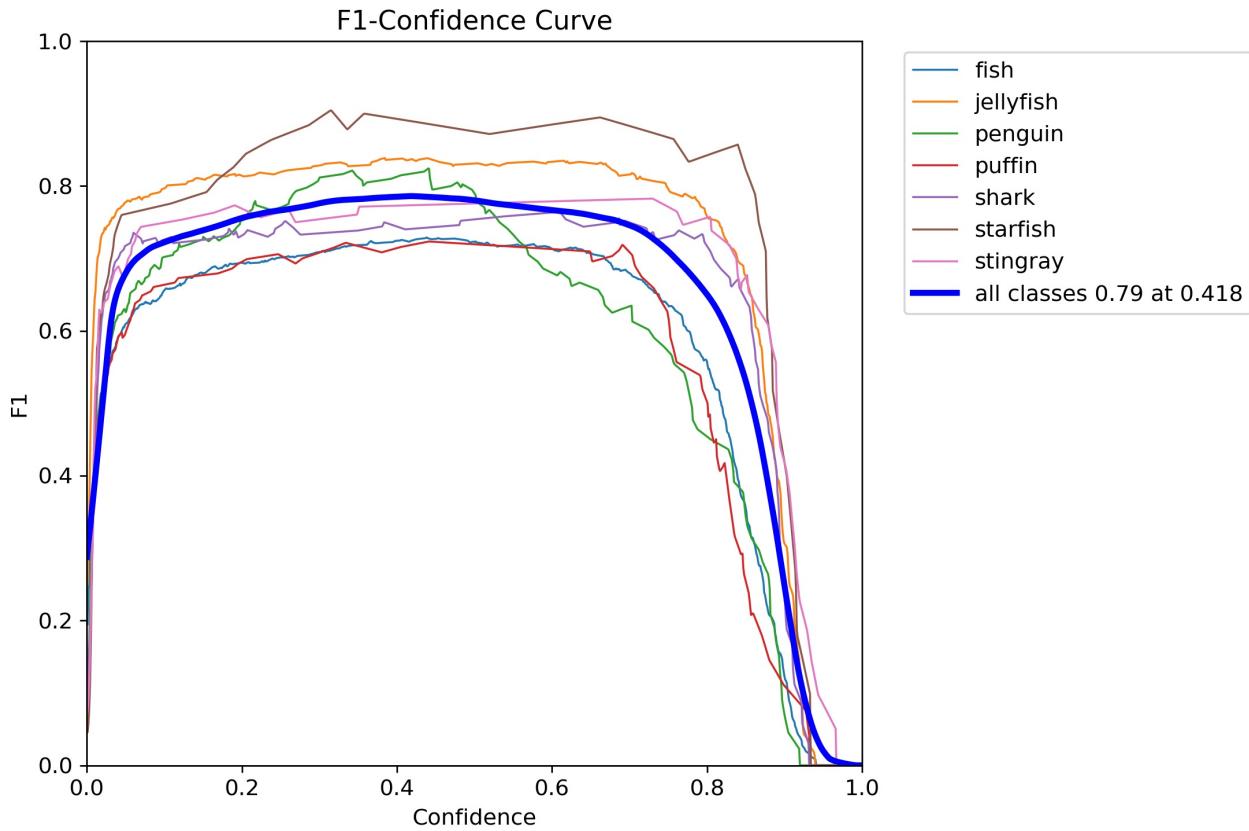




Results

In []:

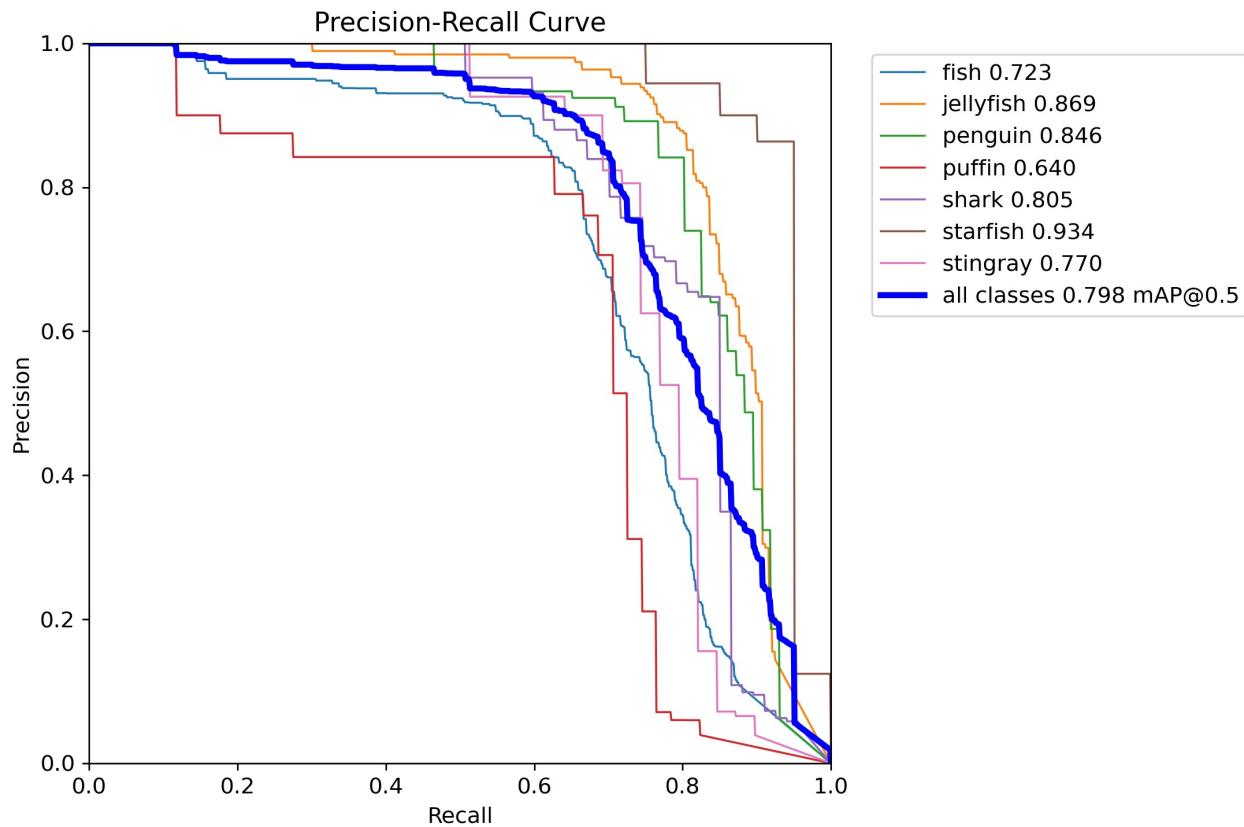
```
#Display the graphs for inference
from IPython.display import Image, display
display(Image('/content/yolov5/runs/train/exp/F1_curve.png'))
```



From the F1-confidence curve, the confidence value that optimizes the precision and recall is 0.418. In many cases higher confidence value is desirable. F1 curve is basically how well our detector is performed.

In []:

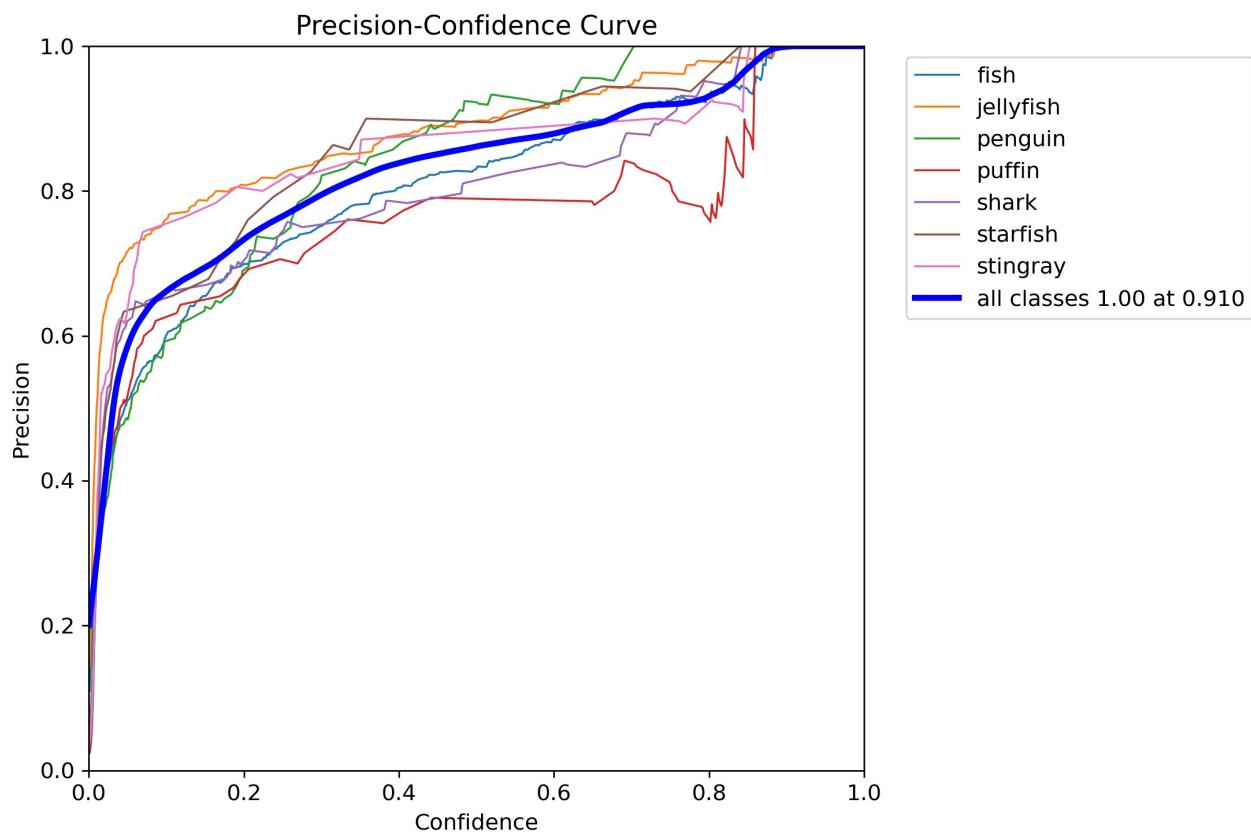
```
display(Image('/content/yolov5/runs/train/exp/PR_curve.png'))
```



The precision recall curve shows the tradeoff between precision and recall of different threshold. A high area under the curve represents the high recall and high precision, high precision means low false positive rate, high recall relates to a low false negative rate. Our curve is as close as possible to the top right corner that means our model performed well.

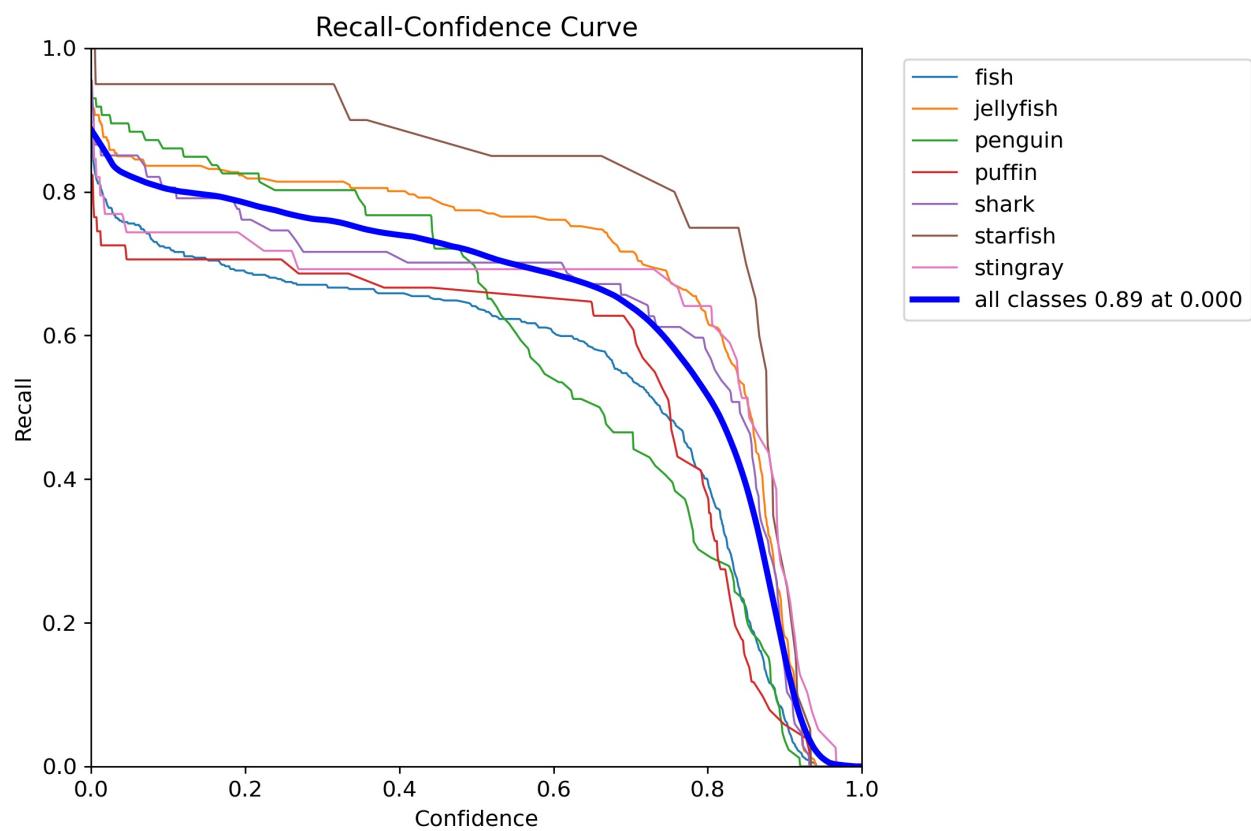
In []:

```
display(Image('/content/yolov5/runs/train/exp/P_curve.png'))
```



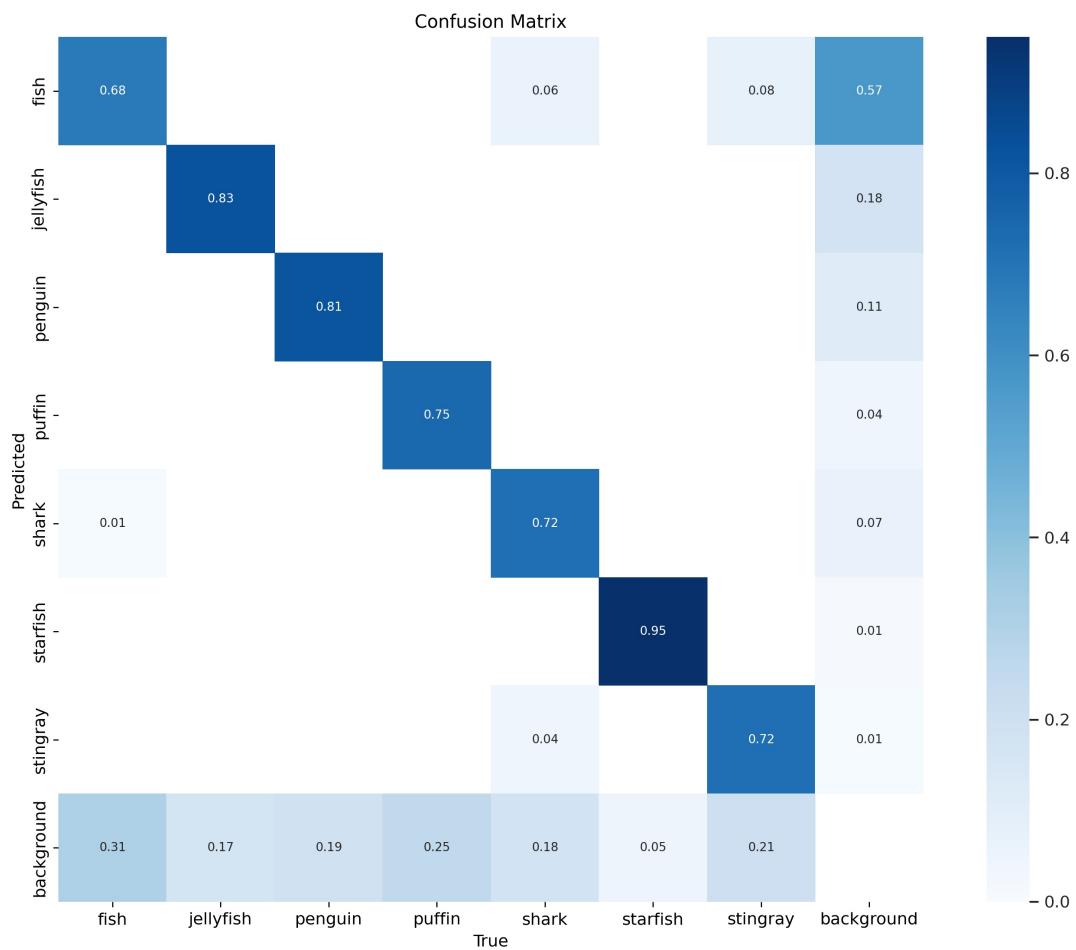
In []:

```
display(Image('/content/yolov5/runs/train/exp/R_curve.png'))
```



In []:

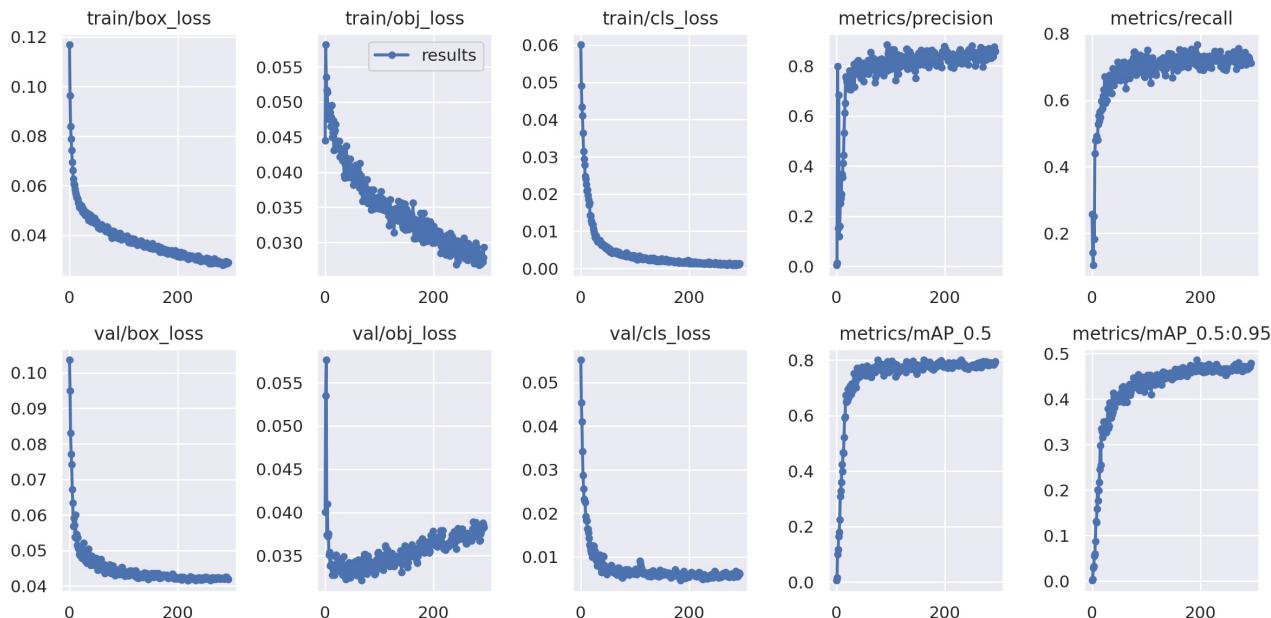
```
display(Image('/content/yolov5/runs/train/exp/confusion_matrix.png'))
```



Confusion matrix is a summary of prediction results on classification problem. The number correct and incorrect predictions are summarized with count values and broken down by each class. The highest prediction is for star fish which is 95% and jellyfish 83% and penguin 81% and so on.

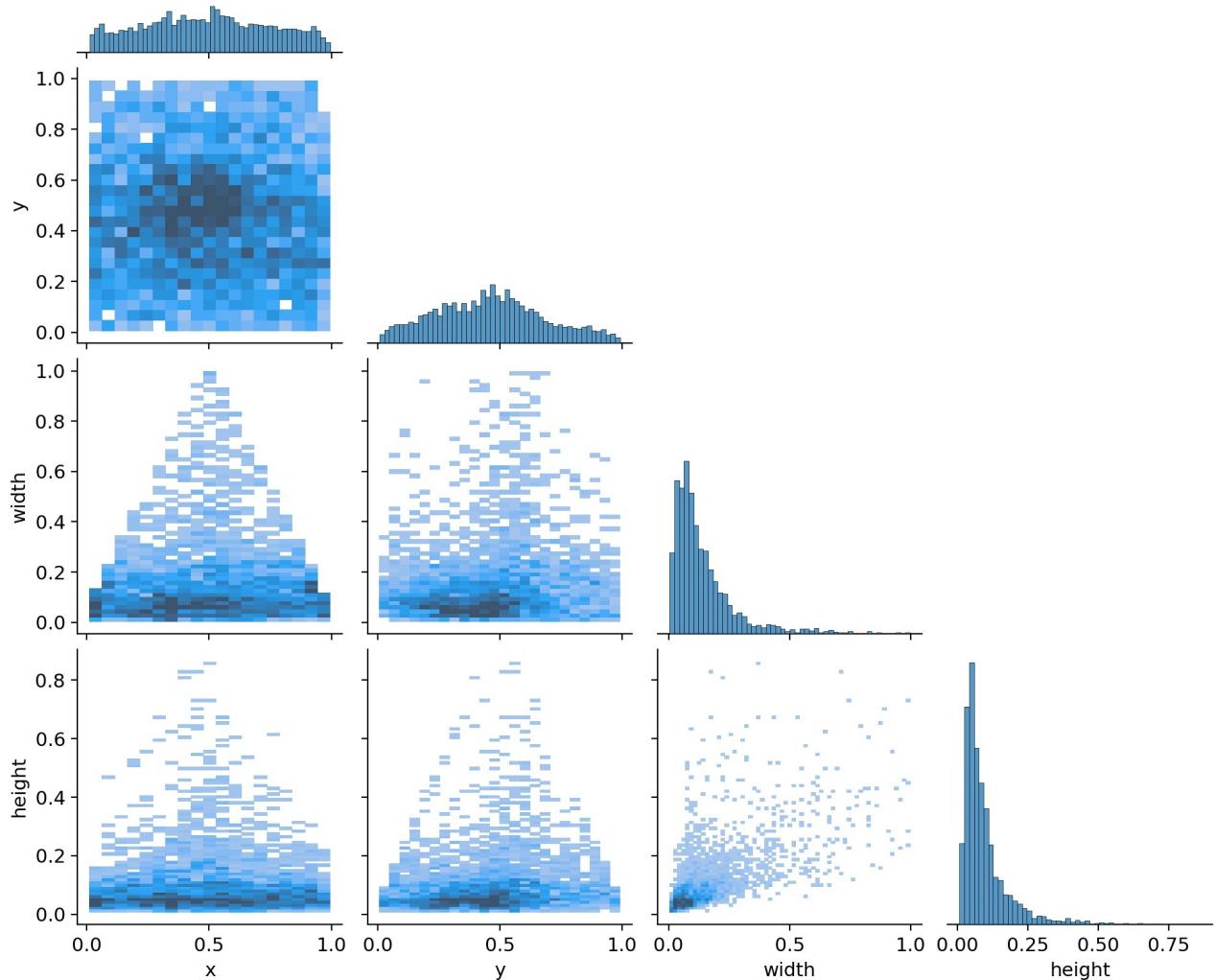
In []:

```
display(Image('/content/yolov5/runs/train/exp/results.png'))
```



In []:

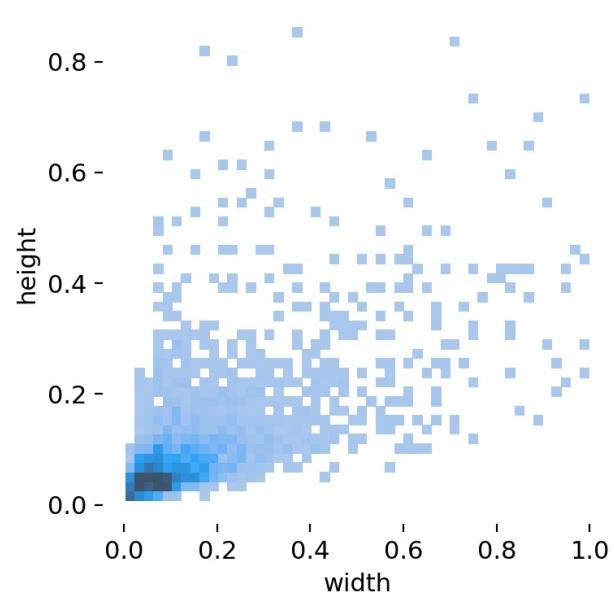
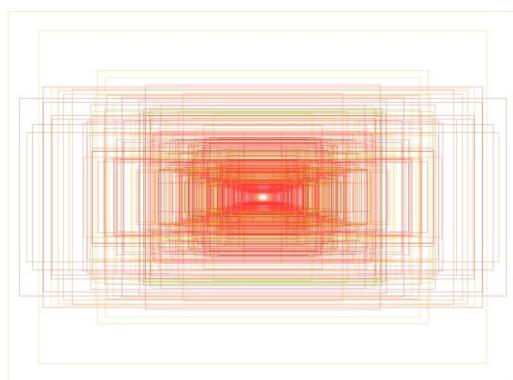
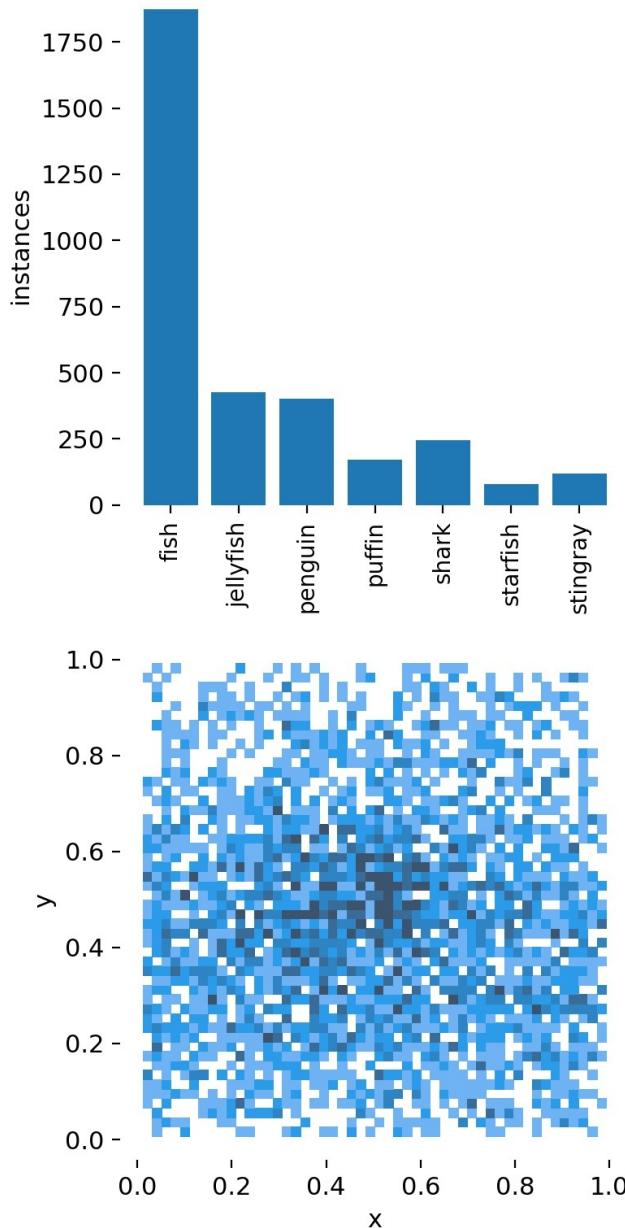
```
display(Image('/content/yolov5/runs/train/exp/labels_correlogram.jpg'))
```



A correlogram or correlation matrix allows to analyse the relationship between each pair of numeric variables of a dataset. A realtionship between each pair is visualized by scatterplot.our correlogram performed well beacuse of high scattering.

In []:

```
display(Image('/content/yolov5/runs/train/exp/labels.jpg'))
```



Display the training batch

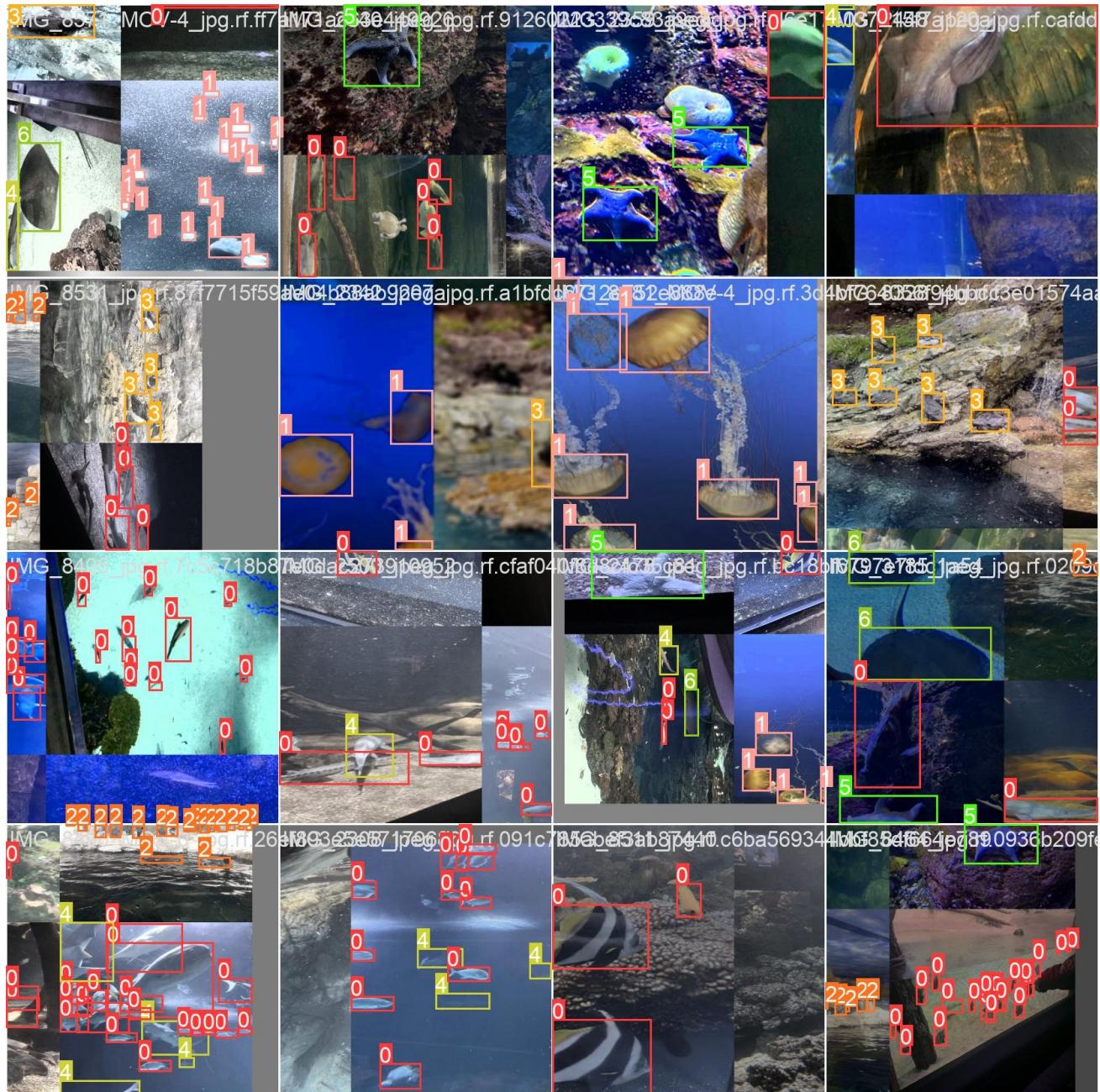
In []:

```
display(Image('/content/yolov5/runs/train/exp/train_batch0.jpg'))
```



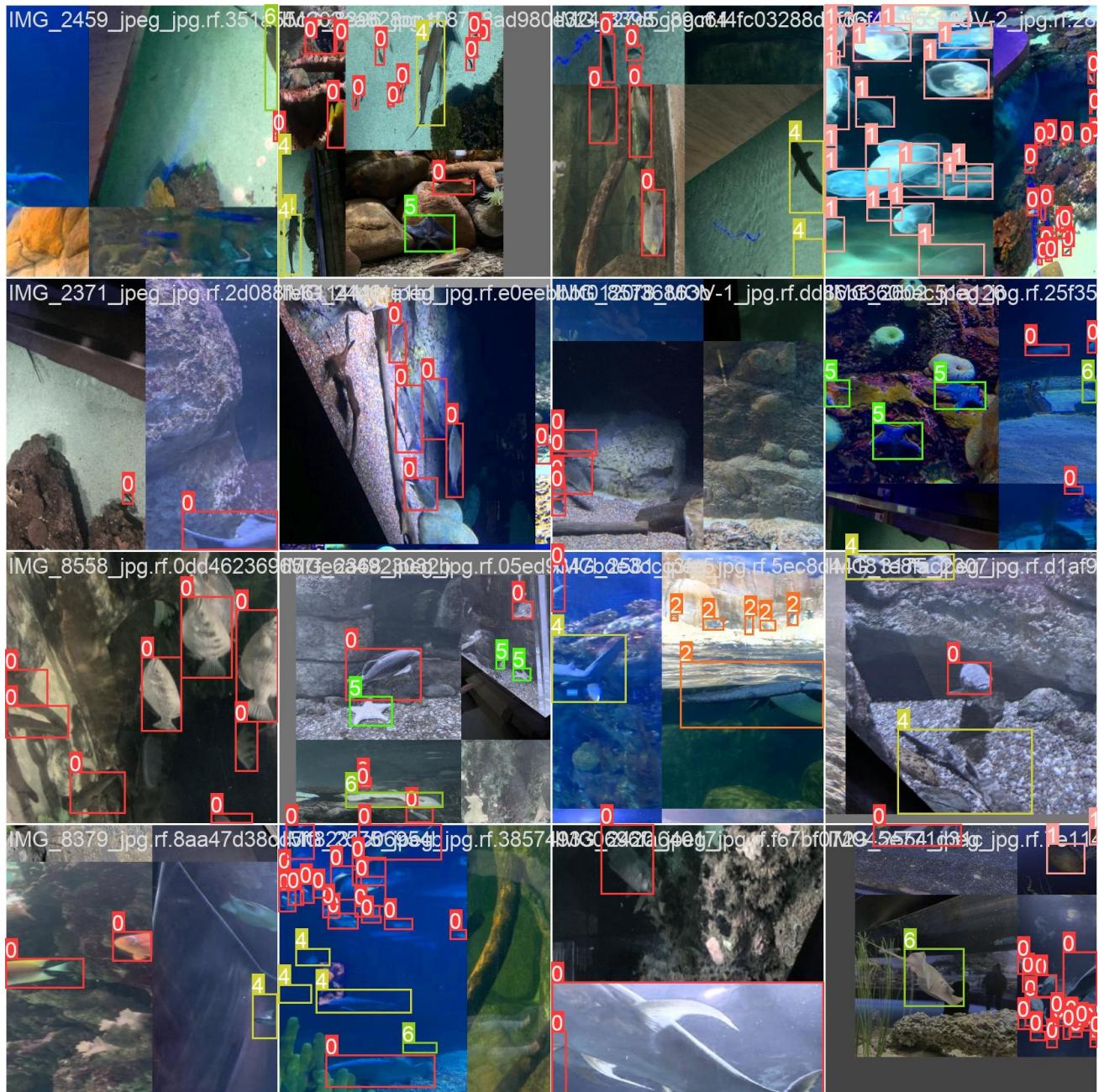
In []:

```
display(Image('/content/yolov5/runs/train/exp/train_batch1.jpg'))
```



In []:

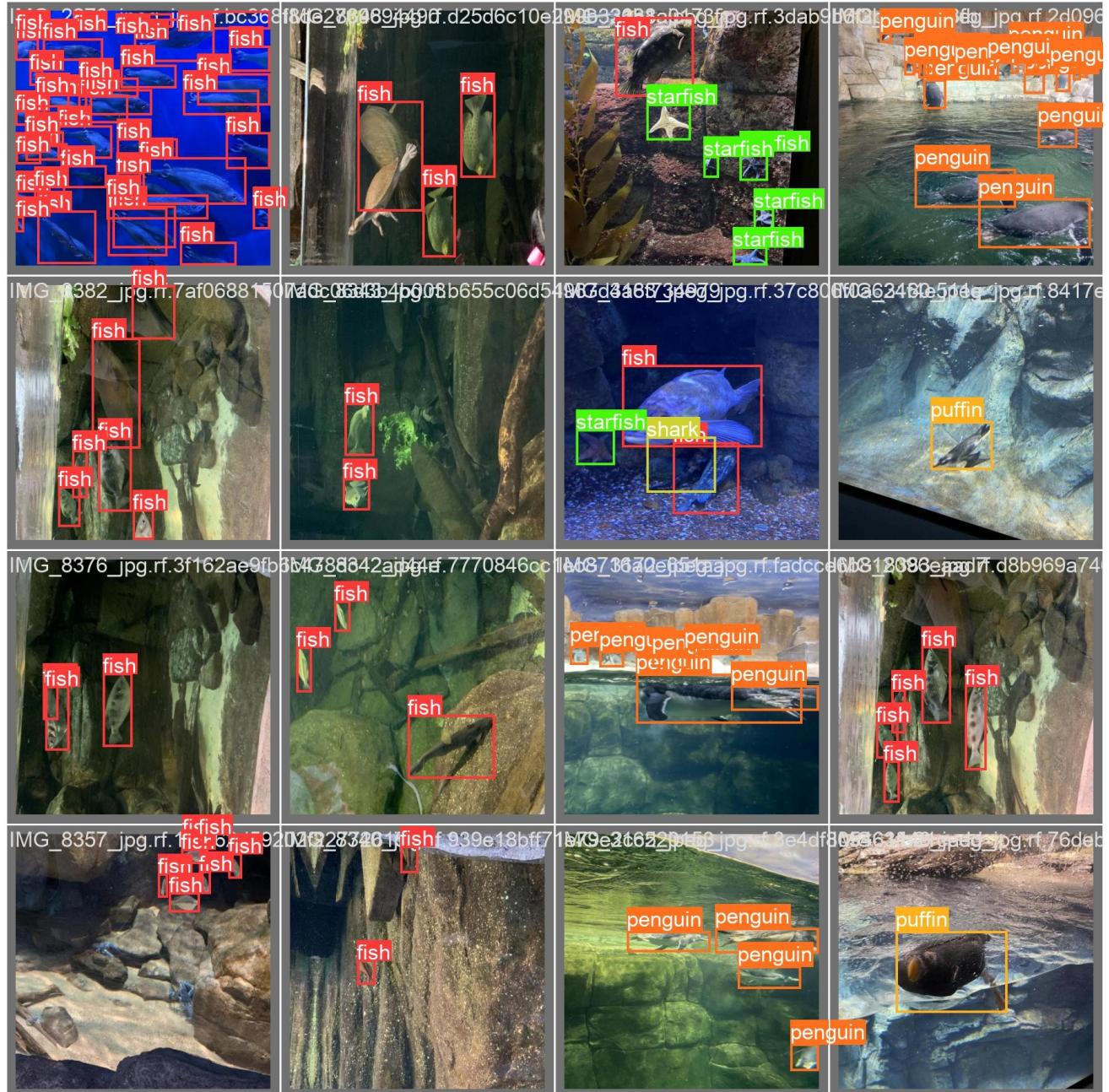
```
display(Image('/content/yolov5/runs/train/exp/train_batch2.jpg'))
```



Display the validation batch

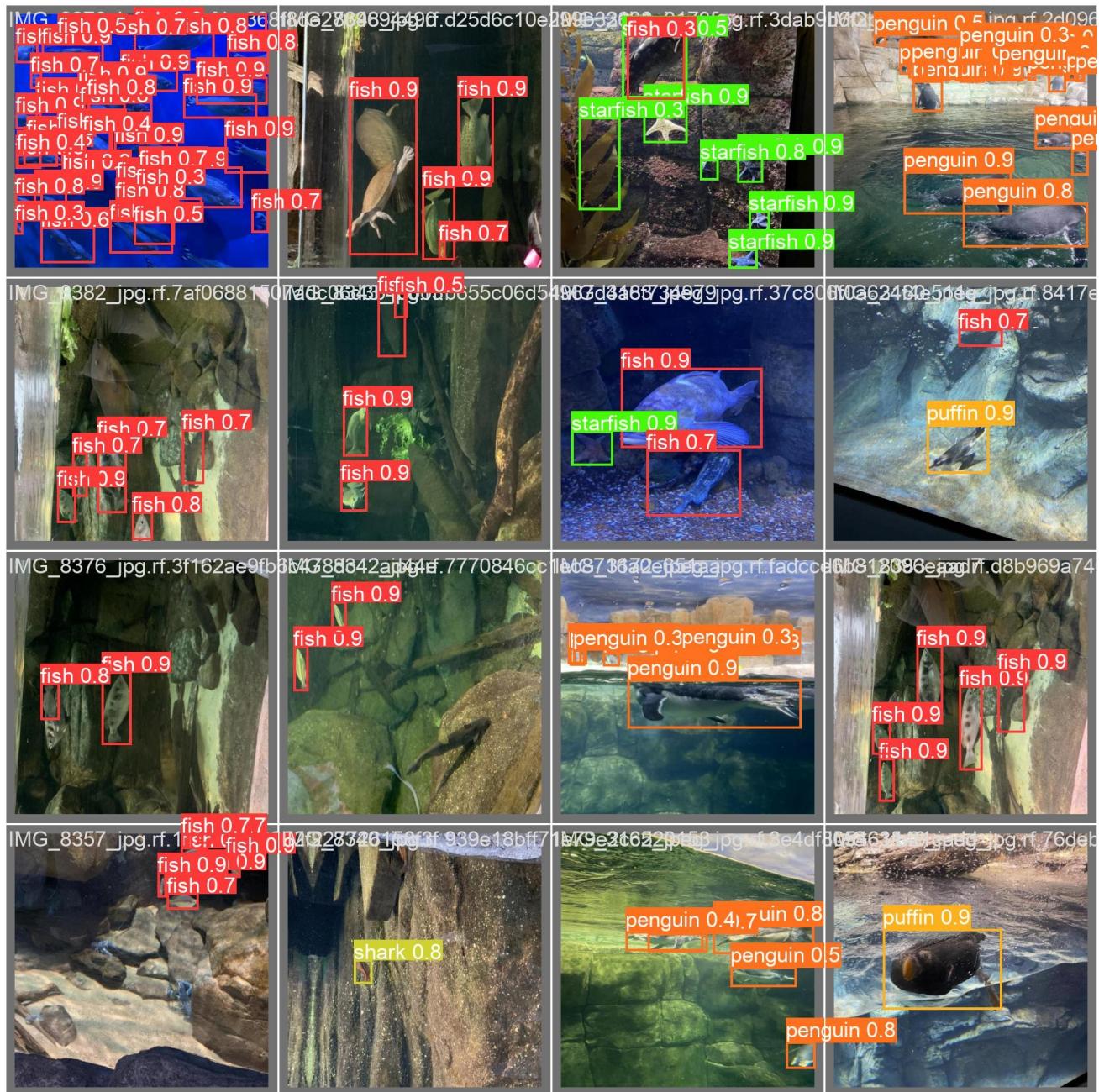
In []:

```
display(Image('/content/yolov5/runs/train/exp/val_batch0_labels.jpg'))
```



In []:

```
display(Image('/content/yolov5/runs/train/exp/val_batch0_pred.jpg'))
```



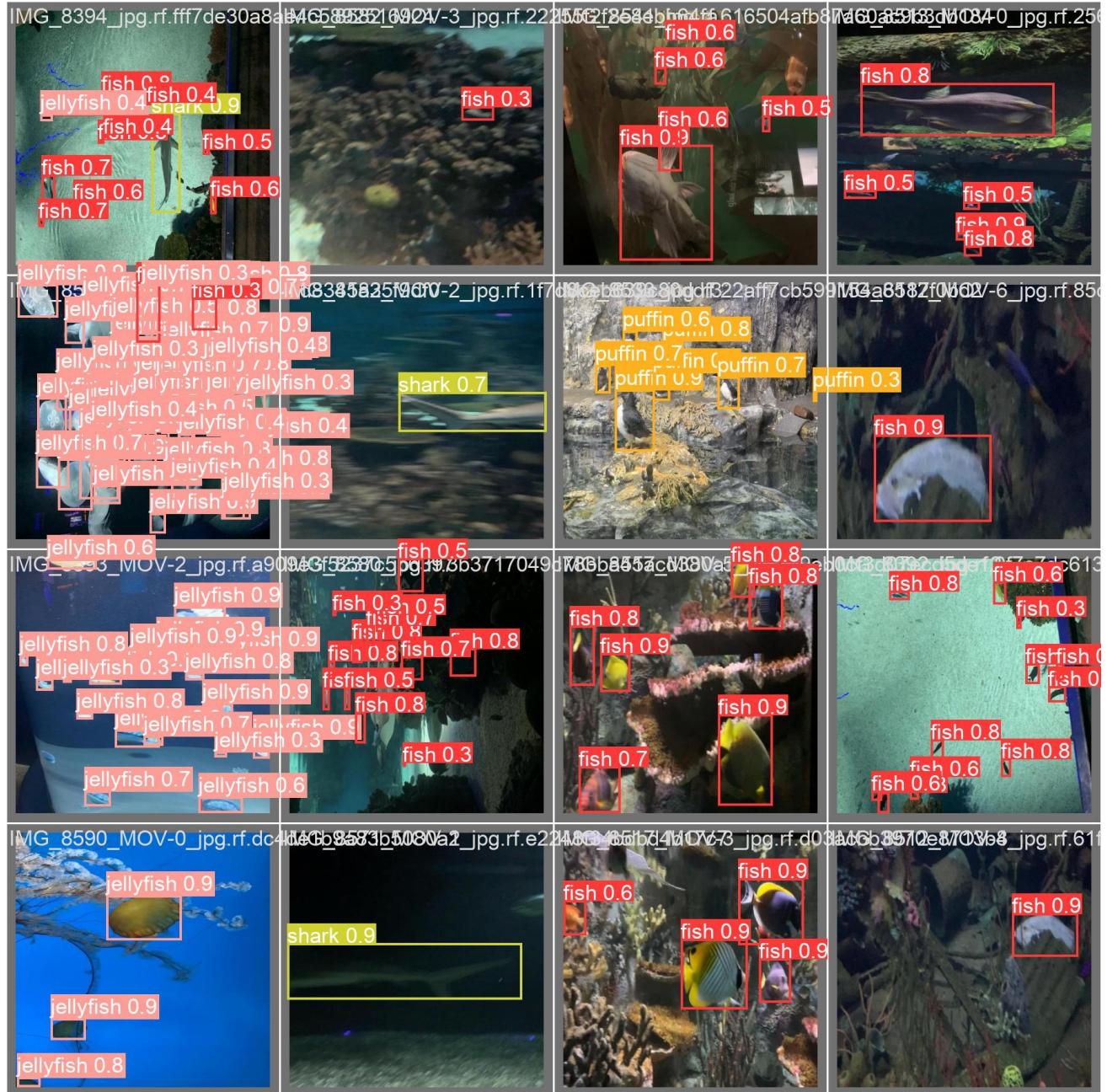
In []:

```
display(Image('/content/yolov5/runs/train/exp/val_batch1_labels.jpg'))
```



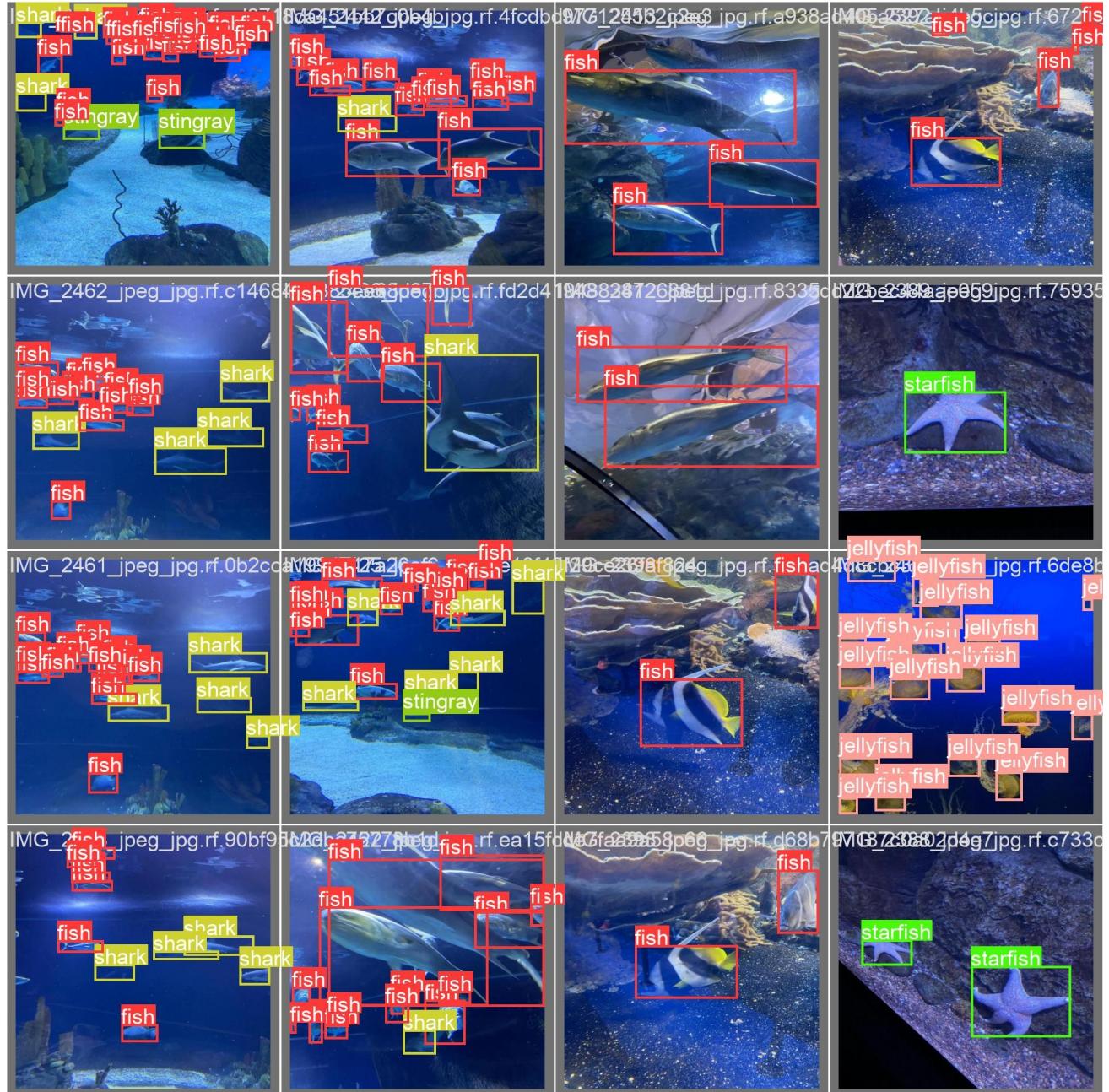
In []:

```
display(Image('/content/yolov5/runs/train/exp/val_batch1_pred.jpg'))
```



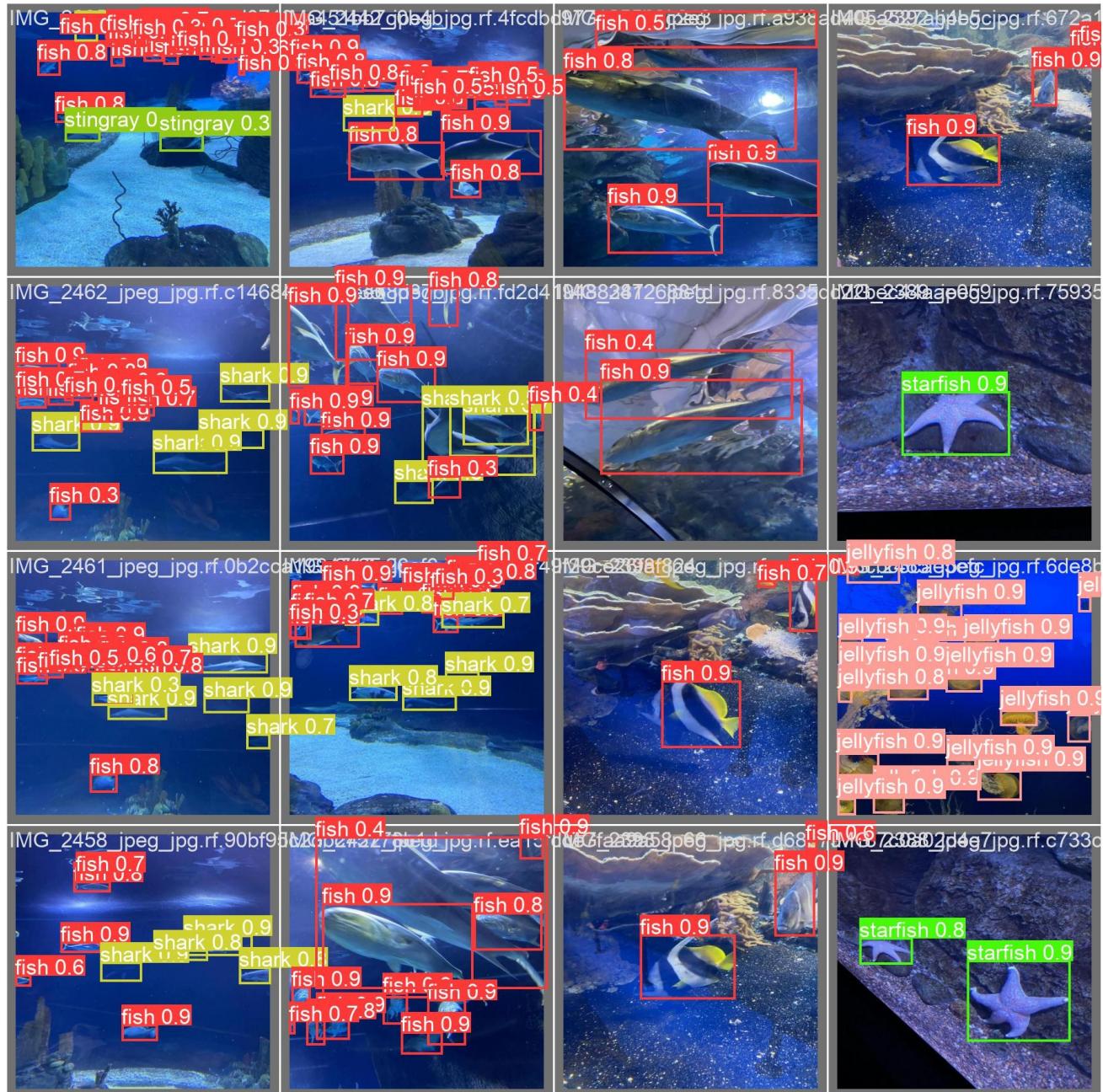
In []:

```
display(Image('/content/yolov5/runs/train/exp/val_batch2_labels.jpg'))
```



In []:

```
display(Image('/content/yolov5/runs/train/exp/val_batch2_pred.jpg'))
```



Discussion

We successfully trained our object detection using YOLOV5 for Aquariums. Aquatic animals play an important role for the environment and humans daily usage. The importance of aquatic animals come from the part of that they provide food, medicine, Energy shelter and raw materials that are used for our daily life. By using this computer vision and Deep learning model we can monitor the sea animals and keep the population under check and protect them from Extinction.

Interpretation

I trained 400 epochos for the best results but my model trained only upto 293 epochos because the best results are observed at epochos 193.I thought best result will be observed between 300 to 400.

Mean average precision is commonly used to analyze the performanace of object detection models. so MAP(mean avearge precision) for the overall model is 0.79% which is pretty good and our model performed very well.

Mean average precision by classes

1. Fish 0.72%
2. jellyfish 0.86%
3. penguin 0.84%
4. puffin 0.64
5. shark 0.80%
6. starfish 0.93%
7. stingray 0.77%

The best performed class is starfish which is 0.93% and least performed class is puffin 0.64%.

Literature citation

<https://github.com/ultralytics/yolov5> (<https://github.com/ultralytics/yolov5>)

<https://app.roboflow.com/kk-fgzul> (<https://app.roboflow.com/kk-fgzul>)

<https://blog.roboflow.com/yolov5-improvements-and-evaluation/> (<https://blog.roboflow.com/yolov5-improvements-and-evaluation/>)

<https://blog.roboflow.com/mean-average-precision/#what-is-the-precision-recall-curve> (<https://blog.roboflow.com/mean-average-precision/#what-is-the-precision-recall-curve>)

<https://github.com/ultralytics/yolov5/wiki/Train-Custom-Data> (<https://github.com/ultralytics/yolov5/wiki/Train-Custom-Data>)

<https://colab.research.google.com/github/roboflow-ai/yolov5-custom-training-tutorial/blob/main/yolov5-custom-training.ipynb>
(<https://colab.research.google.com/github/roboflow-ai/yolov5-custom-training-tutorial/blob/main/yolov5-custom-training.ipynb>)

https://pytorch.org/hub/ultralytics_yolov5#:~:text=YOLOv5%20%F0%9F%9A%80%20is%20a%20family,Model
(https://pytorch.org/hub/ultralytics_yolov5#:~:text=YOLOv5%20%F0%9F%9A%80%20is%20a%20family,Model)