BoXYZ - Train YOLO Carton Box Segmentation

⚠️⚠️⚠️ WARNING ⚠️⚠️⚠️ **MAKE SURE YOU DOWNLOADED AND PROCESSED THE SCD CARTON DATASET BY RUNNING NOTEBOOK 2.1**

Here I train the SCD carton dataset on the instance segmentation task using YOLOv9 (compact) and YOLOv11 (small and medium)

In [ ]:
```
!pip install ultralytics
```

In [ ]:
```
import os

from ultralytics import YOLO

DS_LOCATION = os.environ.get('DS_LOCATION', 'datasets/segment')
```

OSCD Pretraining + OSCD (4 Labels) Fine-Tuning

Pretrain on the OSCD for 17 epochs followed by fine-tuning on the LSCD (4 labels) for 60 epochs

YOLOv9c Segmentation

Pretrain on OSCD

In [ ]:
```
training_output_name = "train_2.2B_1_pt_oscd_yolo9c_epoch17"
model_pt = YOLO('yolov9c-seg.pt')
pt_results = model_pt.train(data=os.path.join(DS_LOCATION, 'ultralytics_cart
                                    name=training_output_name,
                                    epochs=17, imgsz=[600,1000], batch=8, nbs=
```

Fine-tune on LSCD (4 labels)

Fine-tune on the LSCD after training on the OSCD (fine-tuned YOLOv9).

⚠️⚠️⚠️ WARNING ⚠️⚠️⚠️ **ONLY FINE-TUNE AFTER PRETRAINING**

NOTE: change `training_name` to the name of your training instance `'./runs/segment/{training_name}'`

In [ ]:
```
training_name = "train_2.2B_1_pt_oscd_yolo9c_epoch17"
training_output_name = "train_2.2B_2_ft_lscd_yolo9c_epoch50"
model_ft = YOLO(os.path.join('runs', 'segment', training_name, 'weights', 'b
ft_results = model_ft.train(data=os.path.join(DS_LOCATION, 'ultralytics_cart
                            name=training_output_name,
                            epochs=60, imgsz=[800, 1033], batch=4, nbs=64, f
                            cos_lr=True, lrf=0.00001,
                            resume=False)
```

YOLOv11s Segmentation

Pretrain on OSCD

In [ ]:
```
training_output_name = "train_2.2C_1_pt_oscd_yolo11s_epoch17"
model_pt = YOLO('yolo11s-seg.pt')
pt_results = model_pt.train(data=os.path.join(DS_LOCATION, 'ultralytics_cart
                                name=training_output_name,
                                epochs=17, imgsz=[600,1000], batch=4, nbs=
```

Fine-tune on LSCD (4 labels)

Fine-tune on the LSCD after training on the OSCD (fine-tuned YOLOv11)

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NOTE: change `training_name` to the name of your training instance `'./runs/segment/{training_name}'`

In [ ]:
```
training_name = "train_2.2C_1_pt_oscd_yolo11s_epoch17"
training_output_name = "train_2.2C_2_ft_lscd_yolo11s_epoch60"
model_ft = YOLO(os.path.join('runs', 'segment', training_name, 'weights', 'b
ft_results = model_ft.train(data=os.path.join(DS_LOCATION, 'ultralytics_cart
                            name=training_output_name,
                            epochs=60, imgsz=[800, 1033], batch=4, nbs=64, f
                            cos_lr=True, lrf=0.00001,
                            resume=False)
```

YOLOv11m Segmentation

Pretrain on OSCD

In [ ]:
```
training_output_name = "train_2.2D_1_pt_oscd_yolo11m_epoch17"
model_pt = YOLO('yolo11m-seg.pt')
pt_results = model_pt.train(data=os.path.join(DS_LOCATION, 'ultralytics_cart
                                name=training_output_name,
                                epochs=17, imgsz=[600,1000], batch=4, nbs=
```

Fine-tune on LSCD (4 labels)

Fine-tune on the LSCD after training on the OSCD (fine-tuned YOLOv11)

⚠️⚠️⚠️ WARNING ⚠️⚠️⚠️ **ONLY FINE-TUNE AFTER PRETRAINING**

NOTE: change `training_name` to the name of your training instance `'./runs/segment/{training_name}'`

In [ ]:
```
training_name = "train_2.2D_1_pt_oscd_yolo11m_epoch17"
training_output_name = "train_2.2D_2_ft_lscd_yolo11m_epoch60"
model_ft = YOLO(os.path.join('runs', 'segment', training_name, 'weights', 'b
ft_results = model_ft.train(data=os.path.join(DS_LOCATION, 'ultralytics_cart
                            name=training_output_name,
                            epochs=60, imgsz=[800, 1033], batch=4, nbs=64, f
                            cos_lr=True, lrf=0.00001,
                            resume=False)
```

MSCD (OSCD + LSCD 1 Label) Fine-Tuning

Fine-tune on the MSCD (1 label) which is a combination of OSCD and LSCD one-class for 12 epochs. This is what I assume the authors of the SCD paper trained and evaluated on for the instance segmentation task.

YOLOv9c Segmentation - Fine-Tune on MSCD

In [ ]:
```
training_output_name = "train_2.2E_ft_mscd_yolo9c_epoch12"
model_ft = YOLO('yolov9c-seg.pt')
ft_results = model_ft.train(data=os.path.join(DS_LOCATION, 'ultralytics_cart
                            name=training_output_name,
                            epochs=12, imgsz=[800, 1033], batch=4, nbs=64, f
                            cos_lr=True, lrf=0.00001,
                            resume=False)
```

YOLOv11s Segmentation - Fine-Tune on MSCD

In [ ]:
```
training_output_name = "train_2.2F_ft_mscd_yolo11s_epoch12"
model_ft = YOLO('yolo11s-seg.pt')
ft_results = model_ft.train(data=os.path.join(DS_LOCATION, 'ultralytics_cart
                            name=training_output_name,
                            epochs=12, imgsz=[800, 1033], batch=4, nbs=64, f
                            cos_lr=True, lrf=0.00001,
                            resume=False)
```

YOLOv11m Segmentation - Fine-Tune on MSCD

In [ ]:

```
training_output_name = "train_2.2G_ft_mscd_yolo11m_epoch12"
model_ft = YOLO('yolo11m-seg.pt')
ft_results = model_ft.train(data=os.path.join(DS_LOCATION, 'ultralytics_cart
                            name=training_output_name,
                            epochs=12, imgsz=[800, 1033], batch=4, nbs=64, f
                            cos_lr=True, lrf=0.00001,
                            resume=False)
```