YOLOv7-tiny Model Training Results

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1   Training Parameters

- Model: YOLOv7-tiny
- Epochs: 50
- Batch Size: 8
- Image Size: 640x640
- Dataset Con iguration: `/content/data.yaml`
- Hyperparameter Con iguration: `data/hyp.scratch.p5.yaml`
- Key Hyperparameters:

- Initial Learning Rate (`lr0`): 0.01

- Final Learning Rate Factor (`lrf`): 0.1

- Momentum: 0.937

- Weight Decay: 0.0005

- Warmup Epochs: 3.0

- Warmup Momentum: 0.8

- Warmup Bias Learning Rate: 0.1

- Box Loss Weight: 0.05

- Class Loss Weight: 0.3

- Object Loss Weight: 0.7

- IoU Threshold (`iou_t`): 0.2

- Anchor Threshold (`anchor_t`): 4.0

- HSV Augmentation: `hsv_h`=0.015, `hsv_s`=0.7, `hsv_v`=0.4

- Mosaic Augmentation: 1.0

- MixUp Augmentation: 0.15

- Paste-in Augmentation: 0.15

2 Dataset Information

- Training Set:

  - Path: `/content/labels/train`

  - Number of Images: 1235

  - Number of Labels: 1235

- Validation Set:

  - Path: `/content/labels/val`

  - Number of Images: 300

  - Number of Labels: 300

- Classes:

  - `left_turn_signal`

  - `right_turn_signal`

- Test Set:

  - Path: `/content/labels/test`

  - Number of Images: 301

  - Number of Labels: 301

3 Performance Metrics

Ater 50 epochs, the model achieved the ollowing perormance on the validation set:

  - Overall Metrics:

  - mAP@0.5: 0.925

  - mAP@0.5:0.95: 0.585

  - Precision: 0.911

  - Recall: 0.909

- Class-wise Performance:

Class	Images	Labels	Precision	Recall	mAP@0.5	mAP@0.5:0.95
left_turn_signal	300	40	0.892	0.825	0.871	0.568
right_turn_signal	300	260	0.930	0.992	0.978	0.601

Table 1: Class-wise performance metrics on the validation set.

- Training Losses (Final Epoch):

- Box Loss: 0.02939

- Object Loss: 0.00518

- Class Loss: 0.00569

- Validation Losses:

- Box Loss: 0.0104

- Object Loss: 0.0021

- Class Loss: 0.00162

4 Summary

經過 50 個 epoch 訓練的 YOLOv7-tiny 模型在轉向信號燈檢測方面表現出色,整體 mAP@0.5 達到 0.925。 right_turn_signal 類別的 mAP@0.5 顯著提升至 0.978,這得益於其 標籤數量較多(260)。相較之下,left_turn_signal 類別的標籤數量較少(40),效能 略低(mAP@0.5 = 0.871)。