**Object Detection**

**Github link:** https://github.com/Paramesh079/Paramesh\_assignment.git

**Video\_detection\_drive\_link** :

Yolov8n:

<https://drive.google.com/file/d/16qxczWnBMTkkku4FZZDBEOhf52JT-_0r/view?usp=sharing>

yolov8s:

<https://drive.google.com/file/d/1RVZWHZFr11es1Vn9JUP_zwjy-GmwBe7P/view?usp=sharing>

**Exploratory Data Analysis**

**Distribution of classes**

A graph of different colored rectangular shapes

AI-generated content may be incorrect.

* There are 2000 images each in every class folder. (i.e total 6000 images).But there are 5610 images annotations available in the csv file.
* Based on the column “Class”, I filtered the images based on its annotations(coordinates) available in the csv file.

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AI-generated content may be incorrect.**

**Model Training Parameter and performance of YOLOv8 with different weights**

Yolo trained on COCO dataset, I fine-tuned on top of that.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | YOLOv8n | | | | YOLOv8s | | | | |
| Epochs | | 25 | | | | 25 | | | | |
| Batch-size | | 16 | | | | 16 | | | | |
| Input size | | 544 x 928 | | | | 544 x 928 | | | | |
| Optimizer | | SGD | | | | AdamW | | | | |
| Learning rate | | 0.01 | | | | 0.01 | | | | |
| Validation data | | 1122 (398:329:395) | | | | 1122 (398:329:395) | | | | |
|  | **Precision** | | **Recall** | **mAP50** | **mAP50-95** | | **Precision** | **Recall** | **mAP50** | **mAP50-95** |
| all | 0.96 | | 0.971 | 0.984 | 0.873 | | 0.943 | 0.97 | 0.983 | 0.872 |
| ADVISORY SPEED MPH | 0.988 | | 0.998 | 0.995 | 0.909 | | 0.98 | 0.995 | 0.994 | 0.908 |
| DIRECTIONAL ARROW AUXILIARY | 0.931 | | 0.945 | 0.965 | 0.797 | | 0.897 | 0.942 | 0.964 | 0.798 |
| DO NOT ENTER | 0.96 | | 0.969 | 0.99 | 0.913 | | 0.951 | 0.972 | 0.99 | 0.91 |

**Loss Graphs – Yolov8n**

**A graph of a number of graphs

AI-generated content may be incorrect.Loss Graphs – Yolov8s**

**A graph of a graph of a graph

AI-generated content may be incorrect.**

**\*\*More fluctuations in losses using Yolov8s compared to yolov8n and yolov8n performed well than yolov8s.**

**Note on the detection results obtained on the unseen data(images)**

|  |  |  |
| --- | --- | --- |
|  | Total images | No. of Images in which objects detected |
| **yolov8n**  confidence threshold of 0.25 | 232 | 114 |
| **yolov8s**  confidence threshold of 0.25 | 232 | 132 |

* Some frames do not contain any detectable objects, which naturally results in no detections.
* Setting the confidence threshold to **0.25** helps reduce false positives by filtering out low-confidence predictions.
* Some misdetections are there. example: fire station board detected as Advisory Speed MPH.

**Note on the object tracking results**

The testing video’s runtime is 1 min 56 sec and it’s frame rate is 2.

The tracker I used is bytetrack as it is best for Small & low-confidence object tracking.

Some objects did not get IDs as it have low confidence score

|  |  |  |
| --- | --- | --- |
|  | **yolov8n** | **yolov8s** |
| Total images | 232 | 232 |
| No of images in which objects detected | 114 | 131 |
| Confidence threshold | 0.25 | 0.25 |
| No of objects gets track\_id | 11 | 5 |
| Detection rate | 49.1% | 56.5% |
|  | ADVISORY SPEED MPH: 118  DIRECTIONAL ARROW AUXILIARY: 8  DO NOT ENTER: 9 | ADVISORY SPEED MPH: 140  DIRECTIONAL ARROW AUXILIARY: 8  DO NOT ENTER: 9 |