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Report on PS-8: Vehicle Cut-in Detection Using IDD

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Problem Statement: PS-8 Vehicle Cut-in Detection

Introduction: Vehicle cut-in detection is crucial for enhancing safety in autonomous driving technologies. It involves identifying when a vehicle in an adjacent lane is about to cut into the host vehicle's lane. The Indian Driving Dataset (IDD) provides a comprehensive set of annotated images and videos capturing the unique and complex driving conditions in India, including dense traffic and varied road scenarios. By leveraging this dataset, machine learning models were trained to detect and predict cut-in maneuvers, thus improving the overall safety and reliability of autonomous driving systems.

Technical Approach: The dataset used for the project is IDD Dataset that was provided by intel. The size of the dataset is 22.8 GB. The IDD dataset had different images from Bengaluru and Hyderabad. It consisted of 2 folders, one with the JPEG images and another folder with all the annotations

The first step was to convert all the XML files into a format that we could use to train our model. The model used here is YOLOv5. Hence, I converted all the files present in XML format into Pascal VOC format which is used for object detection, segmentation, and classification in computer vision.

I used a small setup with 50 epochs and an 8-batch size to train the model. The model was then retrained using the Big configuration on the same dataset using the weights from the training. We stopped training after this as we reached a precision of around 79% and training further did not increase the precision (All the steps to train the model are given in the readme section of the github repository).

Finally, random images from the internet of Indian and foreign roads were used for testing, and the results were obtained. You can find the results in the “Intel_project\models\yolov5\runs\detect” folder.

Challenges faced:

The dataset was in XML format, so there was a requirement of converting it into Pascal VOC format.

Despite substantial efforts, estimating the time to collision was a huge challenge for me.

It was really challenging to estimate the TTC for the given dataset, hence I implemented it for another dataset. This is the link to that project: <https://github.com/karprickk/PS8-Vehicle-Cut-In-Detection->

Results:

Once the model is trained, running the following command in the “models\yolov5” directory will give the results-

```
“python detect.py --source ../../data/own_images/test1.jpg --weights runs/train/weight1/weights/best.pt --conf 0.4”
```

The results for the above trained model can be viewed in the “Intel_project\models\yolov5\runs\detect” folder.

Given below are few images of the inputs and the outputs obtained:



