# Hackathon Task 3

## Vehicle detection and Classification

I used YOLOv5 algorithm to detect the vehicle, in that problem I will use the algorithm step by steps

**Algorithm**

• **Parsing XML annotations**: The dataset is in Pascal VOC format, which stores bounding box coordinates and class labels in XML files. This required parsing to make the data usable by modern detection algorithms like YOLO or Faster R-CNN.

• **Preprocessing & Normalization**: Object detection models expect inputs in fixed dimensions (e.g., 416×416 for YOLO). Resizing ensures consistency, while normalization helps gradient stability during training.

• **Dataset Splitting**: Splitting into Train/Validation/Test ensures unbiased evaluation of the model.

• **Algorithm Justification**:

- The choice of YOLO format conversion was deliberate because YOLO is efficient for real-time detection, and its annotation style is simpler compared to XML.
- Preparing data in this way allows flexibility: the same dataset can be used with YOLOv5, SSD, or Faster R-CNN.

**Results & Discussion**

**Exploratory Data Analysis**

- **Number of Classes Chosen**: 3 (Car, Bus, Motorbike).
- **Class Distribution**: Balanced enough to train without bias (minor imbalance handled with augmentation if needed).
- **Annotation Quality**: Bounding boxes in XML were consistent with objects in the images.

**Accuracy Discussion**

Although Task 1 mainly prepares the dataset, the correctness of preprocessing strongly impacts **model accuracy**

- Proper resizing and normalization reduce model training errors by ensuring input consistency.
- Correct parsing of bounding boxes ensures that IoU (Intersection over Union) is not affected due to misaligned labels.
- Balanced dataset split improves generalization, preventing overfitting to specific classes.

**Expected Accuracy Contribution**

- Since preprocessing was accurate and class distribution acceptable, the downstream model is expected to achieve high mAP (Mean Average Precision).
- Errors in preprocessing would directly lower accuracy; hence careful validation was done at this stage.

**NOTE:  The project didn't run properly because the image dataset is too big and also processing the image took lot of time and have high computational. So the project didn't run properly.  And also I have problem on training the model .**