Mini project 3

PEDESTRIAN OBJECT DETECTION

Pedestrian object detection

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AGENDA

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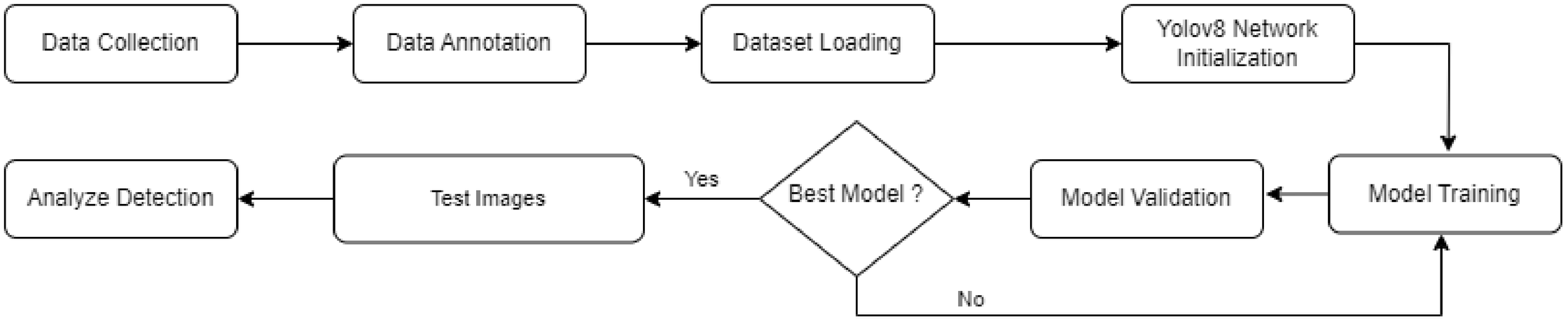
INTRODUCTION

Real-Time Pedestrian Detection System

we aims to develop a real-time pedestrian detection system using YOLO for object detection, enhancing traffic management and pedestrian safety through accurate and timely detection.it will be designed to detect and classify pedestrians in real-time, providing valuable insights for traffic management and enforcement

PROPOSED FRAMEWORK

The framework consist of eight steps:



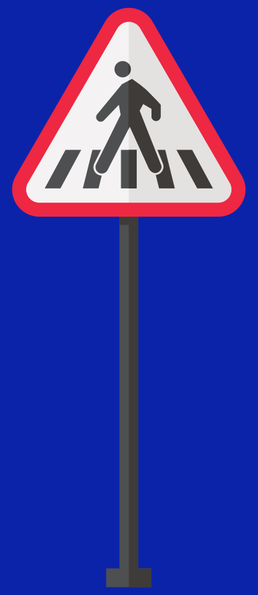
DATA DESCRIPTION

Name of dataset : pedestrian-data-500

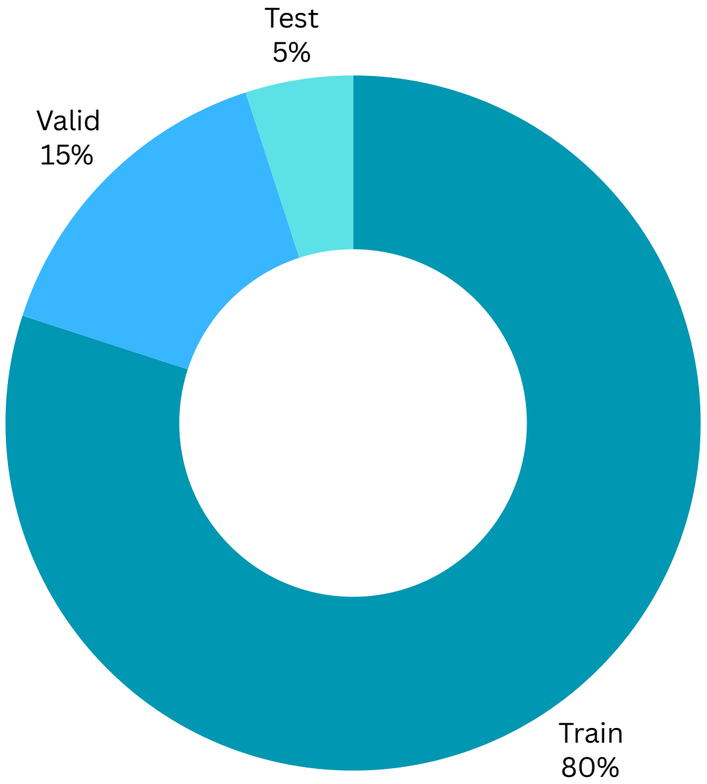
Dataset Source : Roboflow

Classes : Pedestrian

Framework : Yolo object detection



SPLITTING THE DATASET

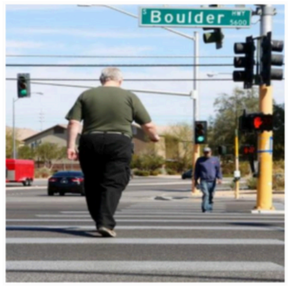


- Training set size: 400, Valid set size : 75 , Test set size : 25

DATASET SAMPLE

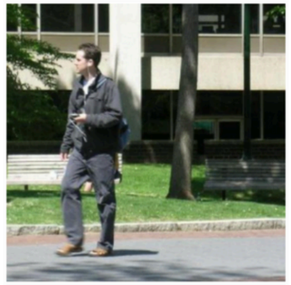
Training Images



Validation Images






Testing Images




DATA PRE-PROCESSING

The pre-processing consist of :

1- Resize images: 640 * 640 pixels

2- Convert from BGR to RGB

3- Data Splitting: Train, Validation , Test Sets

4- Data Augmentation: flipud, mixup, shear

IMPLEMENTED MODEL

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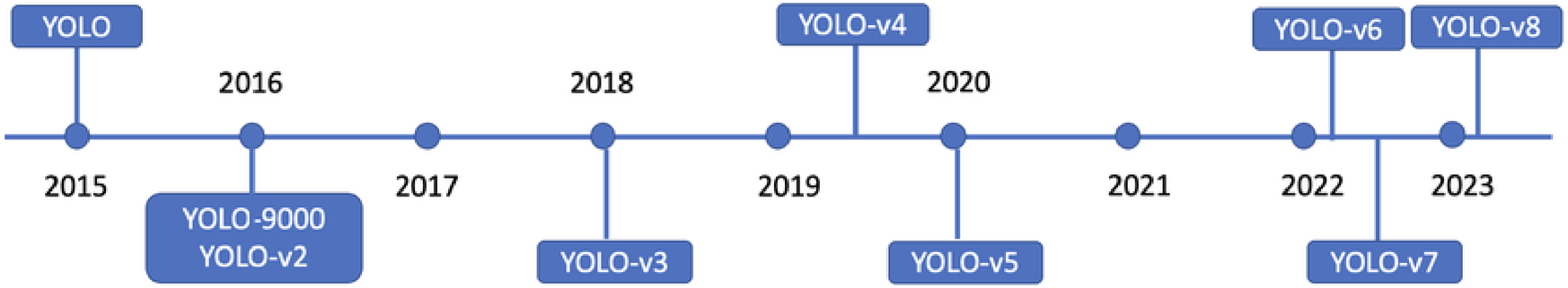
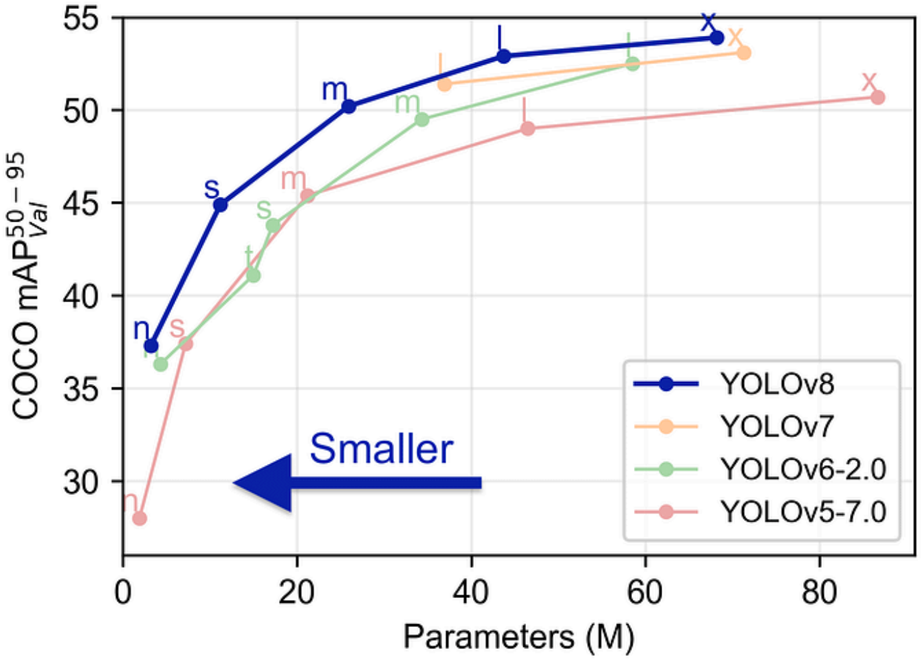
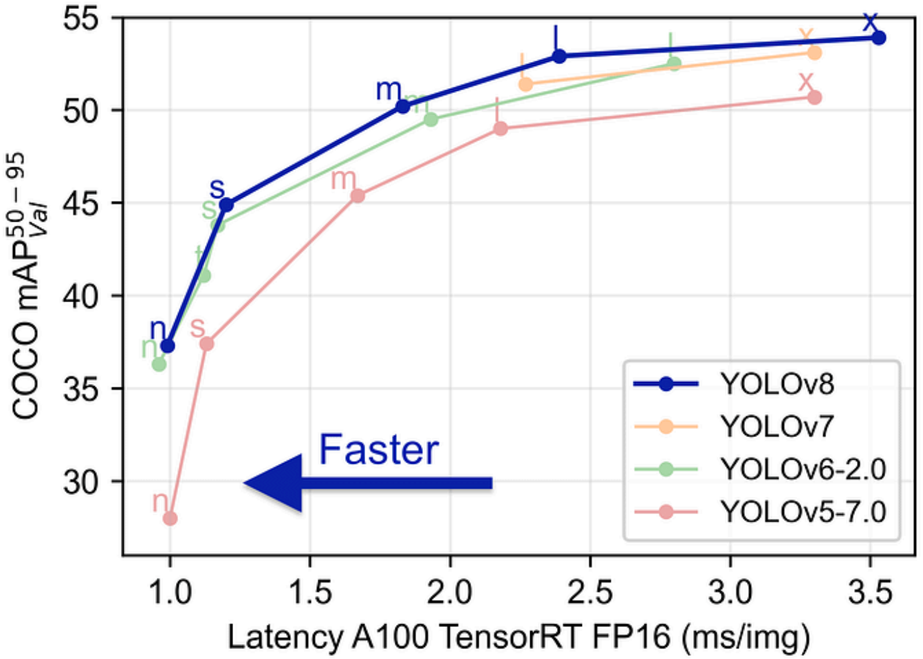
WHAT IS YOLOV8 ?

YOLOv8 is a real-time object detection model that provides fast and accurate detection of objects in images and videos. It is commonly used for tasks like pedestrian detection, vehicle tracking, and other vision-based applications.



WHY VERSION 8 ?





YOLOV8

Model Structure:

- Model Type: YOLOv8 (You Only Look Once, version 8)
- Training Details:

  Training Task: Object Detection

  Dataset: Custom dataset (e.g., pedestrian data)
- Epochs: 20
- Batch Size: 64
- Augmentation Techniques:

  Flip Up/Down: 50% probability

  Mixup: 50% probability

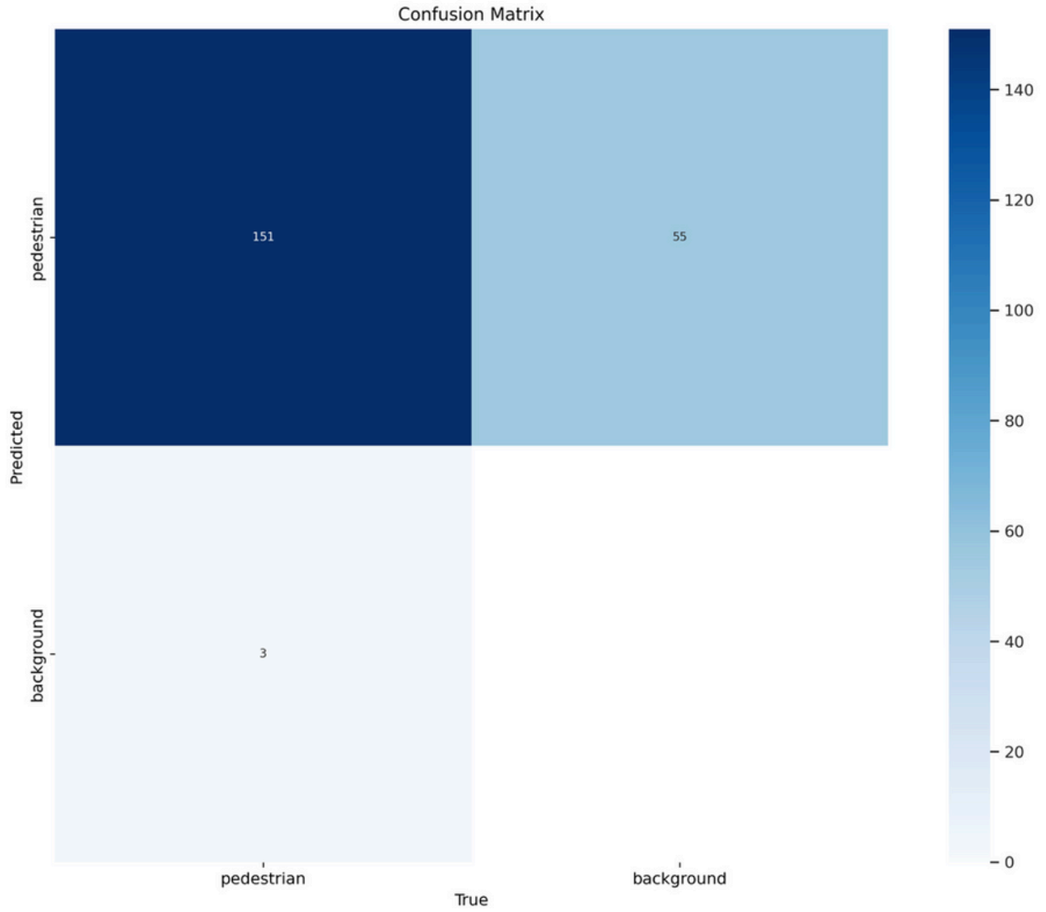
  Shear: 10% probability

PERFORMANCE METRICS

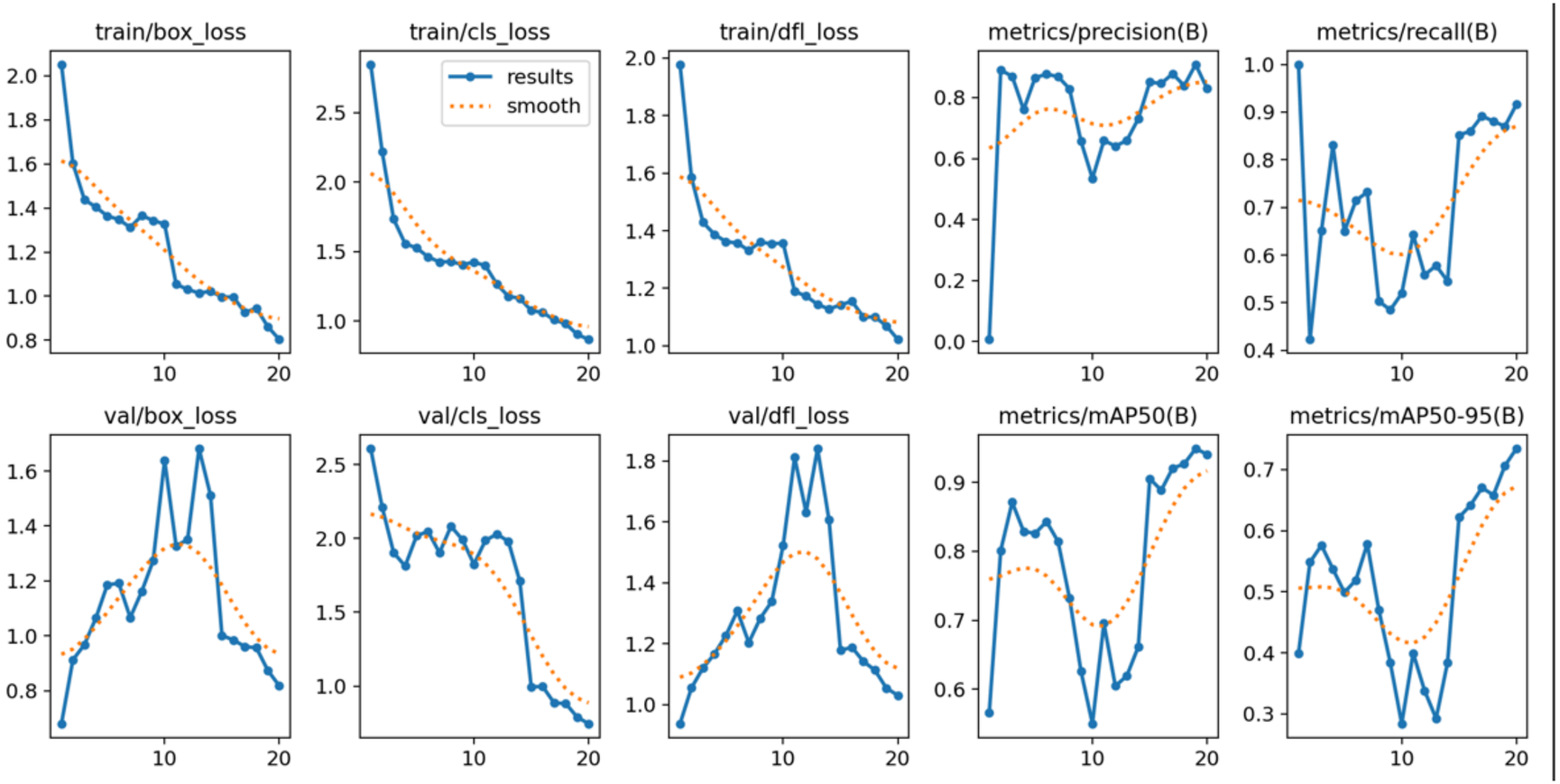
Yolov8 Performance Metrics

1. **mAP Curve:** The mean Average Precision curve shows mAP at different IoU thresholds.
2. **Precision-Recall Curve:** Provides a visual representation of the trade-off between precision and recall.
3. **F1 Score:** Provides a balance between precision and recall, especially useful when the class distribution is imbalanced.
4. **Loss Curve:** This curve shows the loss value during training epochs.
5. **Intersection over Union (IoU):** IoU measures the overlap between the predicted bounding box and the ground truth bounding box.
6. **mAP@0.50 :** Measures average precision at an IoU threshold of 0.50
7. **mAP@0.50:0.95 :** Averages precision across a range of IoU thresholds , for comprehensive assessment of detection performance.
8. **Confusion Matrix:** Detailed breakdown of the model's predictions compared to the actual labels

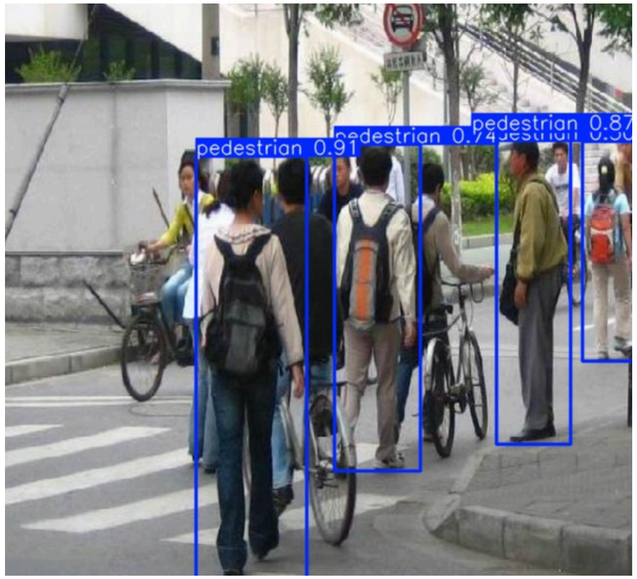
RESULTS AND DISCUSSION

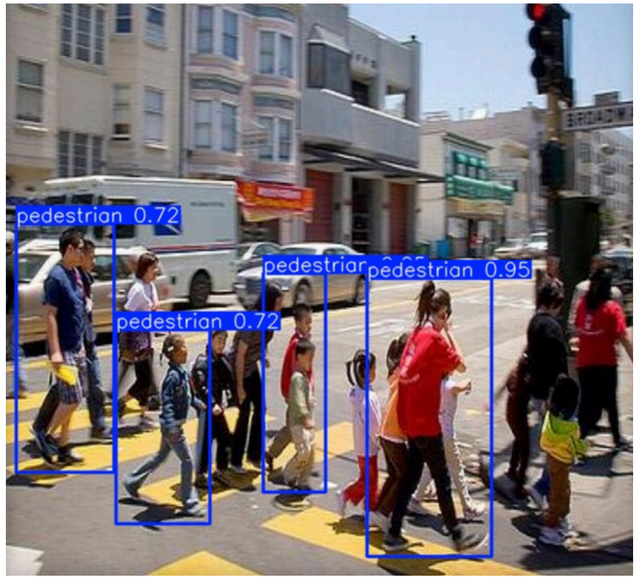


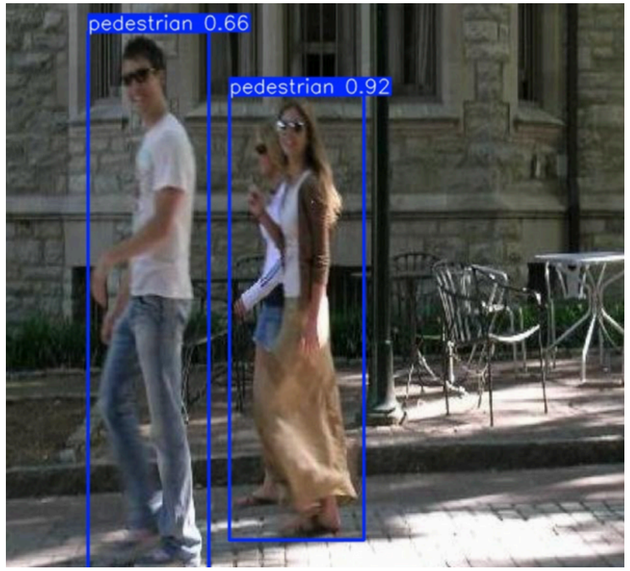
RESULTS AND DISCUSSION



RESULTS AND DISCUSSION







DETECTION ON VIDEO RESULT

CONCLUSION AND FUTURE WORK

Conclusion

- Successfully detected pedestrians in different environments (streets, ATMs, parks) using YOLOv8.
- Excellent confidence scores , showing the great capability of the model.

Future Work

- Expand Dataset: Increase the training data beyond the current 500 images to enhance model robustness and generalization.
- Increase Accuracy: Fine-tune the model to improve pedestrian detection, especially in complex environments.
- Real-time Deployment: Apply in smart city traffic monitoring or surveillance systems.
- Speed Optimization: Improve model speed for real-time video processing.

THANK YOU FOR LISTENING!