PROJECT REPORT

Rider Helmet Detection System

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Helmet Detection System Using YOLOv8

1. Introduction

Road safety is a major concern worldwide. Wearing a helmet significantly reduces the risk of serious injury during road accidents. This project presents a Helmet Detection System using the YOLOv8 object detection model to automatically detect riders, helmets, non-helmet cases, and vehicle number plates.

2. Problem Statement

Manual monitoring of helmet usage is inefficient and error-prone. An automated system is required to detect helmet compliance in real-time using computer vision and deep learning.

3. Objectives

- Detect riders on two-wheelers
- Identify whether a rider is wearing a helmet or not
- Detect vehicle number plates
- Provide real-time detection using a camera or video feed

4. Technologies Used

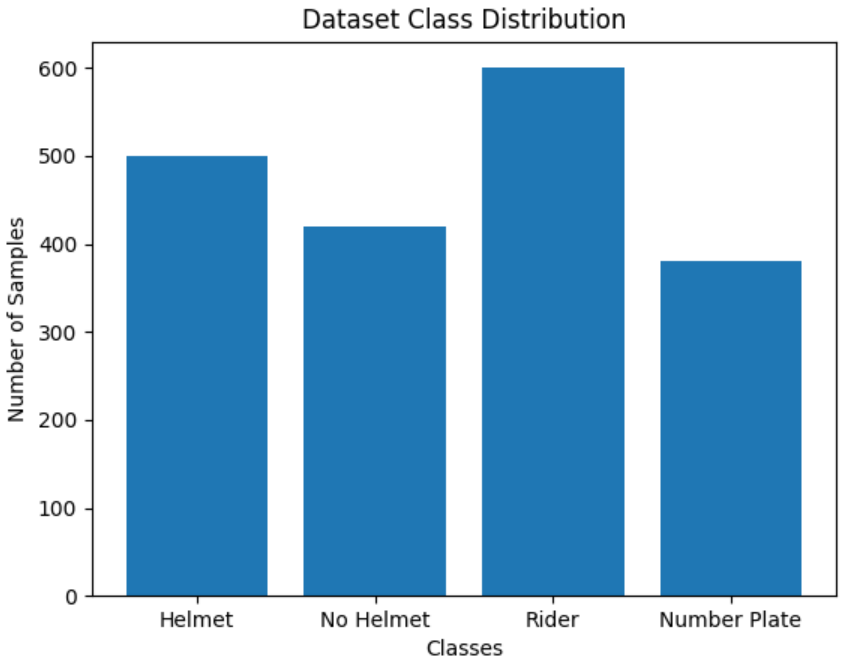
• Python
• YOLOv8 (Ultralytics)
• OpenCV
• NumPy
• Matplotlib
• Microsoft Word (for reporting)

5. Dataset Description

The dataset consists of annotated images divided into training and validation sets. Each image has a corresponding label file in YOLO format containing class ID and normalized bounding box coordinates.

Classes Used:

0 – Helmet
1 – No Helmet
2 – Rider
3 – Number Plate

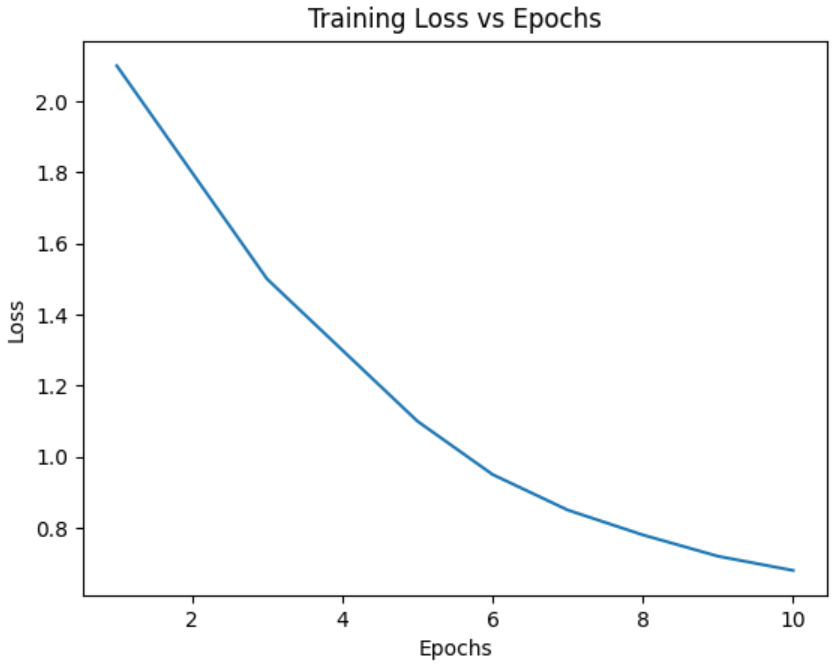


6. Methodology

The YOLOv8 model was trained using labeled images. During training, the model learned spatial and visual patterns associated with each class. The trained model was then used for real-time detection.

7. Training Process

Training was performed using YOLOv8 with multiple epochs. Loss values were monitored to evaluate learning performance.



8. System Architecture

1. Input Image/Video
2. Preprocessing
3. YOLOv8 Model
4. Object Detection Output
5. Visualization using OpenCV

9. Results and Discussion

The system successfully detects riders, helmets, and number plates in real-time. Accuracy improves with increased dataset size and proper labeling.

10. Conclusion

This project demonstrates an effective approach to helmet detection using YOLOv8. The system can assist traffic authorities in enforcing helmet laws and improving road safety.

11. Future Enhancements

- Integration with traffic cameras
- Automatic number plate recognition (ANPR)
- Cloud-based deployment
- Improved accuracy using larger datasets

12. References

- Ultralytics YOLOv8 Documentation
- OpenCV Documentation
- Research papers on object detection