

Title of the Project :
Names of Students :
Name of the Guide :

Helmet Verify: AI Detection System for Safety Check
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Objective

- To design and implement a deep learning algorithm for object detection and recognition in real time.
- To evaluate the performance of the model in real-time using benchmark datasets. To compare the pmodel's performance with other state-of-the-art models for traffic safety.

Abstract

Promoting road safety is a vital issue around the globe. This paper introduces "Helmet Verify," an AI-powered system developed to identify and enforce the use of helmets among motorcycle riders. By utilizing YOLOv11 for precise object detection and integrating it with Arduino Uno for controlling motor functions, the system guarantees adherence by blocking vehicle operation if a helmet is not worn.

The model demonstrates outstanding performance, achieving a mean Average Precision (mAP) of 0.978 and an overall F1-score of 0.96, which makes it a dependable option for real-time implementations. This research contributes to the development of automated safety technologies to lower road accidents and reduce fatalities.

Applications

- Road Safety Enforcement
- Smart Vehicle Systems
- Industrial Safety Monitoring
- Ride-Sharing & Delivery Services

Outcome

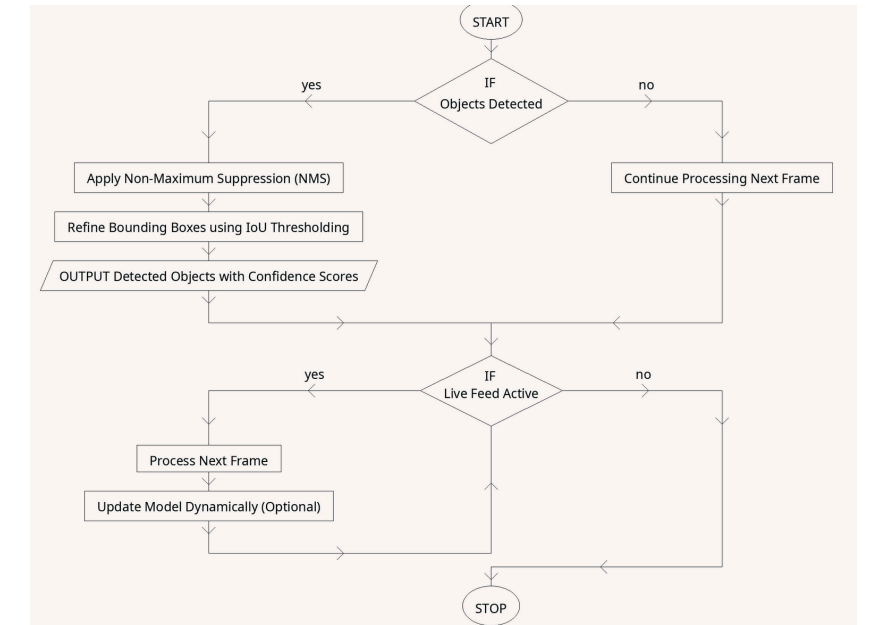
Research Papers :

- Helmet Verify: AI Detection System for Safety Check (Accepted in IEEE Conference [Main Track: ICCSAI2025])
- A Review – Various Object Detection Using Machine Learning Technique

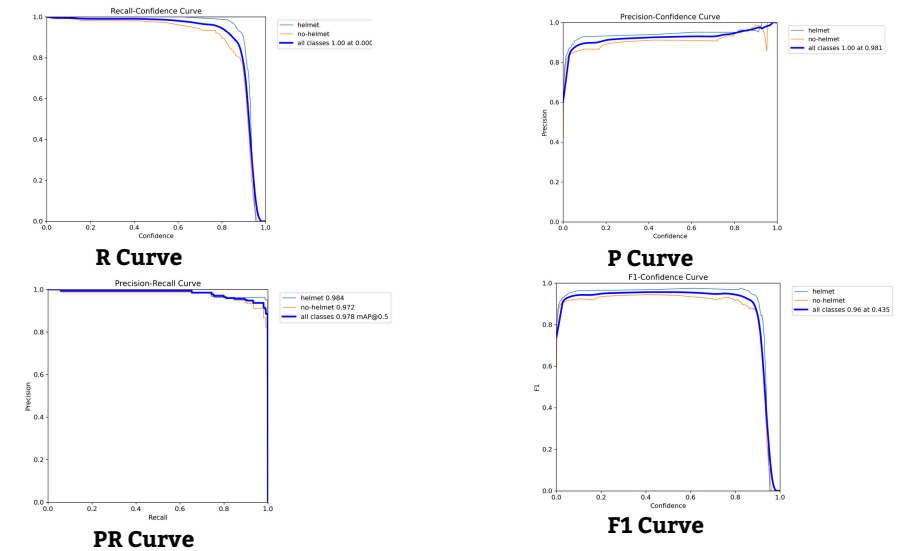
References

- [1]Chaitanya, K., Kumar, A., & Reddy, P. (2022). Helmet detection using YOLO deep learning framework. International Journal of Computer Vision, 130(4), 1234-1245.
<https://doi.org/10.1007/s11263-021-01500-0>
- [2]Kurniawan, A., Setiawan, A., & Prabowo, H. (2023). Traffic congestion detection using CNNs in Intelligent Transport Systems. Transportation Research Part C: Emerging Technologies, 145, 102-115.
<https://doi.org/10.1016/j.trc.2023.102115>

Flow chart/Block Diagram:



Results and Conclusion



Explanation

YOLOv11 model's strong performance in accurately detecting and classifying helmet and no-helmet objects, with high precision, good recall, and a balanced F1-score. The steady improvements in training metrics further indicate the model is well-optimized for the task.

Technology Used:

- Open CV
- Numpy
- Ultralytics
- Python
- HTML
- CSS
- Javascript
- Flask
- YoloV11

Future Scope

Comprehensive Helmet Verify Expansion:

- Integration with Smart Traffic Systems
- Enhanced IoT Connectivity
- AI-Powered Accident Prevention & Alerts