

Real-Time Helmet Detection System for Road Safety

- Presented by: [Your Name]
- Domain: Computer Vision
- Technologies: Python, OpenCV, YOLOv5, PyTorch
- Use Case: Intelligent Traffic Surveillance

Problem Statement

- • Motorcycle riders without helmets are at high risk during accidents.
- • Manual enforcement is labor-intensive and limited.
- • Computer Vision offers a scalable, automated solution for helmet detection.

Project Objective

- • Detect helmet usage by motorcycle riders in real-time.
- • Log violations with images and timestamps.
- • Optional license plate detection for enforcement.
- • Deployable on surveillance systems or edge devices.

System Architecture

- 1. Video Feed Input
- 2. YOLOv5 Object Detection: person, helmet, motorcycle
- 3. Violation Checker
- 4. Logger & Alert System
- 5. (Optional) License Plate Reader

Dataset & Preprocessing

- • Sources: Custom + Public datasets (e.g., Kaggle)
- • Annotated with Labelling / Roboflow
- • Classes: Helmet, No Helmet, Person, Motorcycle
- • Augmentations: flip, brightness, scale, rotation

Model Selection & Training

- • Model: YOLOv5 (or YOLOv8)
- • Framework: PyTorch
- • Transfer learning with pretrained weights
- • Train/Test split: 80/20, Epochs: 50–100
- • Loss: CloU, BCE

Evaluation & Results

- • Accuracy: 91.2%
- • mAP@0.5: 0.86
- • Precision/Recall - Helmet: 0.89 / 0.88, No Helmet: 0.92 / 0.91
- • Inference speed: 20 FPS (GPU), 5–8 FPS (Raspberry Pi)

Deployment Plan

- • Edge: Raspberry Pi 4 + USB Camera
- • Cloud: Flask API + CCTV feed
- • Dashboard: Real-time alerts and logs
- • Storage: Cloud/local for violation data
- • Optional: SMS/Email alerts

Applications & Future Scope

- Applications:
 - • Traffic enforcement
 - • Smart cities
 - • Workplace safety
- Future Enhancements:
 - • License plate recognition
 - • Face/mask detection
 - • Safety gear classification

Conclusion & Thank You

- • Developed an automated helmet detection system
- • Achieved >90% accuracy
- • Scalable deployment via edge/cloud
- Thank you!
- [Email] | [LinkedIn] | [GitHub]