Paper ID

1945

Paper Title

Helmet Verify: AI Detection System for Safety Check

Reviewer Comments and Response

please provide a detailed assessment of the manuscript including the strengths and weaknesses of the paper in terms of novelty, technical content, relevance to Conference, quality of references, and experiments.

- The manuscript technically is correct. As the paper justify the selection of YOLOv11 over other models and sufficient analysis of failure cases. It is written in the research paper in **Section III: Proposed YOLOv11 Architecture**, after introducing YOLOv11's features, There is a paragraph that justify its selection over YOLOv7 and YOLOX. "YOLOv11 was chosen over YOLOv7 and YOLOX due to its superior balance of speed and accuracy. While YOLOv7 offers high accuracy, it requires more computational power, making it less suitable for real-time enforcement. YOLOX, though efficient, has slightly lower detection accuracy in safety-critical tasks. YOLOv11 improves detection with adaptive anchor boxes, a refined loss function, and a CSPNet-ResNet backbone, achieving a **mAP of 0.978**, outperforming YOLOv7 (**0.961**) and YOLOX (**0.948**) while maintaining faster inference speed, making it ideal for real-time helmet detection."

- **The contribution has novelty. This paper clearly differentiate itself from existing helmet detection methods.** It is written in the research paper in **Section II: Related Work**, after TABLE 1. COMPARATIVE STUDY. "While previous studies on helmet detection have used YOLOv4, YOLOv5, and YOLOv7, most focus only on detection rather than enforcement. **Helmet Verify** goes beyond by integrating **real-time enforcement using Arduino Uno**, ensuring practical safety compliance. Unlike prior models, our approach reduces **false positives and false negatives** with a **custom loss function**, making it more reliable. Additionally, **Helmet Verify actively enforces helmet usage by disabling vehicle operation**, setting it apart from detection-only systems."

- The level of experimental validation is sufficient in all aspects, such as dataset size, real-time deployment feasibility analysis. It is written in the research paper in **Section IV: Result Analysis**, after Figure 5: a) CONFUSION MATRIX b) CONFUSION MATRIX NORMALIZATION. "Our **1,200-image dataset** captures diverse conditions (lighting, weather, angles) to ensure robustness. Despite its size, the model achieves **mAP@0.5 of 97.8%** with **45 FPS inference speed** on an **NVIDIA T4 GPU**. **Latency analysis (22ms per frame)** confirms real-time feasibility. **Failure analysis** shows minimal false positives and negatives, with an **F1-score of 0.96**, making the system reliable for safety enforcement."

- The technical contribution is significant, and may have major impact on the research community. It is written in the research paper in **Section IV: Result Analysis**, after Figure 5: a) CONFUSION MATRIX b) CONFUSION MATRIX NORMALIZATION. "Our **1,200-image dataset** captures diverse conditions (lighting, weather, angles) to ensure robustness. Despite its size, the model achieves **mAP@0.5 of 97.8%** with **45 FPS inference speed** on an **NVIDIA T4 GPU**. **Latency analysis (22ms per frame)** confirms real-time feasibility. **Failure analysis** shows minimal false positives and negatives, with an **F1-score of 0.96**, making the system reliable for safety enforcement."

- The references are improved.