

**SISTEM DETEKSI PELANGGARAN HELM
BERBASIS *YOU ONLY LOOK ONCE* v8 (*YOLOv8*) DAN
*FLASK***

Oleh

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ABSTRAK

Tingginya angka kecelakaan lalu lintas menimbulkan korban jiwa karena cedera kepala yang disebabkan oleh pengendara sepeda motor yang tidak mengenakan helm mendorong pentingnya penelitian ini. Keterbatasan sumber daya dalam melakukan razia dan mengawasi penggunaan helm untuk menekan angka pelanggaran membutuhkan solusi berupa sistem otomatis yang dapat mendeteksi pengendara sepeda motor yang tidak menggunakan helm. Pada penelitian ini menggunakan *YOLOv8* untuk menghasilkan model deteksi pengendara yang melanggar. *YOLOv8* dipilih karena memenuhi kebutuhan deteksi cepat, akurasi tinggi, dan penerapan pada perangkat *edge* yang terbatas. Penelitian ini telah menghasilkan model yang dapat mendeteksi pengendara sepeda motor yang melanggar aturan tidak menggunakan helm. Dataset yang digunakan terdiri dari berbagai gambar pengendara motor dan aksesoris kepala, yang kemudian dianotasi dan dilatih menggunakan lima versi model *YOLOv8* (*nano, small, medium, large, xlarge*). *Hyperparameter default YOLOv8* digunakan dengan *learning rate* 0.01, *optimizer SGD*, *batch size* 16, *weight decay* 0.001, dan *100 epochs*. Dari hasil pelatihan, model terbaik dipilih berdasarkan nilai *recall* tertinggi yaitu model *xlarge*. *Recall* dari model pengendara sebesar 95,2% dan *recall* dari model penggunaan helm sebesar 92%. Pada data *testing* jika dihitung berdasarkan hasil deteksinya nilai *recall* untuk model deteksi pengendara sebesar 96% dan deteksi penggunaan helm sebesar 91,5%. Dari segi kecepatan *inference* model versi *xlarge* memiliki kecepatan 28 ms pada model deteksi pengendara dan 29,9 ms pada deteksi penggunaan helm. Model terbaik ini berhasil diimplementasikan pada sistem berbasis *Flask*, dengan *input* berupa video *real-time* dan video *upload*. Sistem mampu mendeteksi pengendara sepeda motor dan memeriksa penggunaan helm. Sistem juga berhasil menyimpan gambar pengendara yang melanggar tidak menggunakan helm.

Kata Kunci: *YOLOv8*, Pelanggaran Helm, *Flask*, Deteksi Objek

HELMET VIOLATION DETECTION SYSTEM
USING YOU ONLY LOOK ONCE v8 (YOLOv8) AND
FLASK

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ABSTRACT

The high rate of traffic accidents resulting in fatalities due to head injuries caused by motorcyclists not wearing helmets underscores the importance of this research. The limited resources for conducting inspections and monitoring helmet use to reduce violations necessitate an automated system to detect motorcyclists not wearing helmets. This study employs YOLOv8 to develop a model for detecting violating motorcyclists. YOLOv8 was chosen due to its ability to meet the needs for fast detection, high accuracy, and implementation on constrained edge devices. This research has produced a model capable of detecting motorcyclists who violate helmet-wearing rules. The dataset used consists of various images of motorcyclists and head accessories, which were then annotated and trained using five versions of the YOLOv8 model (nano, small, medium, large, xlarge). The default hyperparameters of YOLOv8 were used, with a learning rate of 0.01, SGD optimizer, batch size of 16, weight decay of 0.001, and 100 epochs. Based on the training results, the best model was selected based on the highest recall value, which was the xlarge model. The recall of the motorcyclist detection model was 95.2%, and the recall of the helmet usage detection model was 92%. On the testing data, the recall value for the motorcyclist detection model was 96%, and for the helmet usage detection model, it was 91.5%. In terms of inference speed, the xlarge version of the model had a speed of 28 ms for motorcyclist detection and 29.9 ms for helmet usage detection. This best model was successfully implemented in a Flask-based system, with input in the form of real-time video and video uploads. The system can detect motorcyclists and check helmet usage. The system also successfully saves images of motorcyclists violating the helmet-wearing rules.

Keywords: YOLOv8, Flask, Helmet Violation, Object Detection