ANALISIS SISTEM DETEKSI REAL-TIME INDIKASI TINDAKAN KEKERASAN DAN SENJATA TAJAM/SENJATA API OTOMATIS MENGGUNAKAN MODEL *YOLOV8*

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ABSTRAK

Kekerasan di ruang publik menjadi isu yang semakin mengkhawatirkan, terutama di wilayah padat penduduk seperti lingkungan kampus. Sistem pengawasan konvensional menggunakan CCTV memiliki keterbatasan dalam hal efisiensi dan akurasi deteksi. Penelitian ini bertujuan untuk merancang dan mengimplementasikan sistem deteksi kekerasan otomatis secara *real-time* dengan memanfaatkan model YOLOv8 (You Only Look Once versi 8). Proses penelitian mencakup tahapan ekstraksi *frame* dari video, anotasi data dengan bantuan *Roboflow*, pelatihan model menggunakan *PyTorch*, augmentasi data, *fine-tuning* model, dan pengujian sistem dalam berbagai kondisi pencahayaan dan pergerakan. Hasil evaluasi menunjukkan bahwa model yang telah dioptimasi menghasilkan nilai mAP@0.5 sebesar 0.902, F1-score sebesar 0.87, serta *precision* antara 91–95% dan *recall* sebesar 90%, meningkat signifikan dibandingkan model awal tanpa optimasi (mAP 0.813 dan F1-score 0.76). Selain itu, sistem mampu berjalan secara *real-time* dengan kecepatan rata-rata 21.95 *frame per second* (FPS) dan waktu pemrosesan sekitar 45.55 milidetik per *frame*, menggunakan GPU NVIDIA RTX 2060 Laptop. Sistem ini juga dilengkapi antarmuka grafis (GUI) yang memungkinkan visualisasi hasil deteksi serta pencatatan peristiwa secara otomatis. Penelitian ini menunjukkan bahwa sistem deteksi kekerasan berbasis YOLOv8 memiliki performa tinggi dan potensi implementasi nyata dalam meningkatkan efektivitas pengawasan keamanan publik.

Kata kunci: *Computer vision,* deteksi kekerasan*,* GUI*, real-time,* senjata*,* YOLOv8

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ABSTRACT

Violence in public spaces has become an increasingly alarming issue, especially in densely populated areas such as campus environments. Conventional surveillance systems using CCTV are limited in terms of detection efficiency and accuracy. This study aims to design and implement a real-time automated violence detection system using the YOLOv8 (You Only Look Once version 8) model. YOLOv8 was chosen for its ability to perform fast and accurate object detection, making it suitable for identifying violent actions as well as the presence of sharp weapons and firearms. The research process involved frame extraction from video, data annotation using Roboflow, model training with PyTorch, data augmentation, model fine-tuning, and system testing under various lighting and motion conditions. The evaluation results show that the optimized model achieved a mean Average Precision (mAP@0.5) of 0.902, an F1-score of 0.87, precision ranging from 91% to 95%, and recall of 90%, which significantly improved compared to the baseline model without optimization (mAP 0.813 and F1-score 0.76). Moreover, the system operates in real-time at an average speed of 21.95 frames per second (FPS) with a processing time of approximately 45.55 milliseconds per frame, tested on an NVIDIA RTX 2060 Laptop GPU. The system is also equipped with a graphical user interface (GUI) that provides real-time detection visualization and automatic event logging. This research demonstrates that the YOLOv8-based violence detection system delivers high performance and holds strong potential for real-world implementation in enhancing public security monitoring.

Keywords *: Computer vision, GUI, real-time, violence detections, weapons, YOLOv8*