

IMPLEMENTASI DEEP LEARNING UNTUK DETEKSI DAN PEMETAAN TITIK KERUSAKAN JALAN MENGGUNAKAN CITRA DIGITAL

(Studi Kasus di Kelurahan Terban)

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INTISARI

Penelitian ini mengembangkan sistem deteksi kerusakan jalan berbasis *computer vision* menggunakan model *You Only Look Once version 11 (YOLO11)*. Sistem dirancang untuk mengidentifikasi empat jenis kerusakan jalan, yaitu *longitudinal crack*, *transverse crack*, *alligator crack*, dan *pothole*. Dataset yang digunakan berasal dari gabungan *Sekilab Road Damage Dataset* dan citra lapangan dengan informasi GPS. Model dilatih dalam tiga tahap (50, 75, dan 100 *epochs*) menggunakan GPU NVIDIA P100. Hasil terbaik diperoleh pada pelatihan 75 *epochs* dengan *precision* 0,561, *recall* 0,517, *mAP@0.5* 0,561, dan *mAP@0.5–0.95* 0,262. Kelas *alligator crack* paling mudah dideteksi karena pola retakannya jelas, sedangkan *transverse crack* paling sulit akibat kemiripan dengan bayangan objek jalan. Secara keseluruhan, model YOLO11 mampu mendeteksi kerusakan jalan dengan akurasi yang baik dan berpotensi diterapkan untuk pemantauan kondisi jalan berbasis citra lapangan secara otomatis.

Kata Kunci: YOLO11, Deteksi Kerusakan Jalan, GPS, *Computer Vision*

***IMPLEMENTATION OF DEEP LEARNING FOR ROAD
DAMAGE DETECTION AND MAPPING USING DIGITAL
IMAGES***

(Case Study in Terban Village)

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ABSTRACT

This study develops a road damage detection system using computer vision and the You Only Look Once version 11 (YOLO11) model. The system identifies four road damage types: longitudinal crack, transverse crack, alligator crack, and pothole. The dataset combines the Sekilab Road Damage Dataset with field images containing GPS information. The model was trained for 50, 75, and 100 epochs using an NVIDIA P100 GPU. The best performance was achieved at 75 epochs with precision of 0.561, recall of 0.517, mAP@0.5 of 0.561, and mAP@0.5–0.95 of 0.262. The alligator crack class was the easiest to detect, while the transverse crack was the most challenging due to shadow interference. Overall, YOLO11 effectively detects road surface damage with good accuracy and has potential for automated, image-based road condition monitoring.

Kata Kunci: YOLO11, Road Damage Detection, GPS, Computer Vision