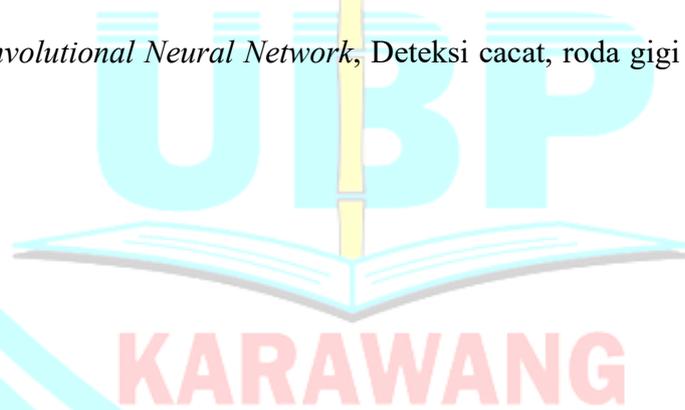# ABSTRAK

Dalam industri manufaktur, proses klasifikasi komponen secara manual sering kali memakan waktu, tidak konsisten, dan rawan kesalahan. Penelitian ini mengusulkan metode deteksi otomatis menggunakan algoritma *Convolutional Neural Network* (CNN) dengan model YOLOv8m-seg untuk mengidentifikasi part gear sentrik yang memiliki bentuk mirip dalam jumlah besar. Sebanyak 1000 gambar dikumpulkan menggunakan kamera DSLR dan box foto untuk memastikan pencahayaan merata. Data kemudian dilabeli secara manual menggunakan Roboflow dan ditingkatkan melalui teknik *preprocessing* dan augmentasi sehingga menjadi 7359 gambar dalam format YOLO. Model dilatih selama 40 *epoch* dan dievaluasi menggunakan metrik *Precision, Recall, F1-score,* dan *mAP*. Hasil evaluasi menunjukkan mAP@0.5 sebesar 0.967, *F1-score* rata-rata 0.95 pada *confidence* 0.464, serta akurasi total 95%. Model juga berhasil diuji secara langsung menggunakan kamera dan mampu mendeteksi part seperti Leaver, Spring, WT, dan Shaft secara akurat. Temuan ini menunjukkan bahwa metode CNN dengan YOLOv8m-seg efektif untuk deteksi otomatis part gear dalam lingkungan industri manufaktur.

Kata Kunci : *Convolutional Neural Network*, Deteksi cacat, roda gigi sentrik, YOLOv8m-seg

ABSTRAC

In the manufacturing industry, the process of manually classifying parts is often time-consuming, inconsistent and error-prone. This research proposes an automatic detection method using Convolutional Neural Network (CNN) algorithm with YOLOv8m-seg model to identify a large number of similar shaped centric gear parts. A total of 1000 images were collected using a DSLR camera and a photo box to ensure even lighting. The data was then manually labeled using Roboflow and enhanced through preprocessing and augmentation techniques resulting in 7359 images in YOLO format. The model was trained for 40 epochs and evaluated using Precision, Recall, F1-score, and mAP metrics. The evaluation results showed mAP@0.5 of 0.967, an average F1-score of 0.95 at confidence 0.464, and a total accuracy of 95%. The model was also successfully tested live using a camera and was able to accurately detect parts such as Leaver, Spring, WT, and Shaft. These findings show that the CNN method with YOLOv8m-seg is effective for automatic detection of gear parts in an industrial manufacturing environment.

Keywords: *Convolutional Neural Network, Defect detection, centric gears, YOLOv8m-seg*