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**Analisis Pengaruh Data Augmentation terhadap Performa YOLOv8n, YOLOv8s, dan YOLOv8m pada Deteksi
Diabetic Foot Ulcer dan Wound**
Raihan Ichlasul Akmal, Ir. Unan Yusmaniar Oktiawati, S.T., M.Sc., Ph.D., IPU.
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INTISARI

Analisis Pengaruh Data Augmentation terhadap Performa YOLOv8n, YOLOv8s, dan YOLOv8m pada Deteksi Diabetic Foot Ulcer dan Wound

Raihan Ichlasul Akmal

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Diabetic Foot Ulcer merupakan salah satu komplikasi serius pada penderita diabetes melitus yang dapat menyebabkan infeksi, kerusakan jaringan, hingga amputasi apabila tidak terdeteksi dan ditangani sejak dini. Selain *Diabetic Foot Ulcer*, luka luar (*wound*) seperti *abrasion*, *burn*, *cut*, dan *bruise* juga memerlukan identifikasi yang cepat dan akurat. Perkembangan *deep learning*, khususnya *object detection*, memberikan peluang untuk membantu proses identifikasi luka secara otomatis melalui analisis citra digital. Penelitian ini bertujuan menganalisis pengaruh *data augmentation* serta membandingkan performa model YOLOv8n, YOLOv8s, dan YOLOv8m dalam mendeteksi *Diabetic Foot Ulcer* dan *wound*. Dataset yang digunakan terdiri atas 3.285 citra yang terbagi menjadi dua kelas, yaitu *Diabetic Foot Ulcer* dan *wound*, dengan rasio pembagian data 80% *training*, 10% *validation*, dan 10% *testing*. Proses *preprocessing* dilakukan menggunakan variasi ukuran citra 224×224, 512×512, dan 640×640 piksel, kemudian dibandingkan sebelum dan sesudah penerapan *data augmentation* yang meliputi *horizontal flip*, *rotation*, *brightness and contrast adjustment*, HSV, *random scale*, CLAHE, dan *Gaussian blur*. Evaluasi dilakukan menggunakan metrik *precision*, *recall*, *F1-score*, *Intersection over Union* (IoU), *mean Average Precision* (mAP), dan efisiensi komputasi. Hasil penelitian menunjukkan bahwa ukuran citra 640×640 piksel menghasilkan performa terbaik, sedangkan *data augmentation* tidak selalu meningkatkan performa model. Konfigurasi terbaik diperoleh pada YOLOv8n tanpa *data augmentation* dengan resolusi 640×640 piksel yang menghasilkan nilai mAP@0.5 sebesar 81,6%, sehingga memberikan keseimbangan terbaik antara akurasi dan efisiensi komputasi.

Kata kunci: *Diabetic Foot Ulcer*, *Wound*, YOLOv8, *Data Augmentation*, *Object Detection*, *Deep Learning*.

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ABSTRACT

Analysis of Data Augmentation Effects and Performance Comparison of YOLOv8n, YOLOv8s, and YOLOv8m for Diabetic Foot Ulcer and Wound Detection

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Diabetic Foot Ulcer (DFU) is one of the most severe complications of diabetes mellitus that may lead to infection, tissue damage, and even amputation if not detected and treated promptly. In addition to DFU, common wounds such as *abrasions*, *burns*, *cuts*, and *bruises* also require accurate and timely identification to support appropriate clinical management. Recent advances in *deep learning*, particularly *object detection*, have enabled automated wound detection through digital image analysis. This study investigates the effect of *data augmentation* and compares the performance of YOLOv8n, YOLOv8s, and YOLOv8m in detecting DFU and *wounds*. A dataset of 3,285 images, consisting of two classes (*Diabetic Foot Ulcer* and *wound*), was divided into training, validation, and test sets using an 80:10:10 ratio. Image preprocessing was conducted using three input resolutions f(224×224, 512×512, and 640×640 pixels). The models were evaluated with and without *data augmentation*, including *horizontal flip*, *rotation*, *brightness and contrast adjustment*, HSV, *random scaling*, CLAHE, and *Gaussian blur*. Performance was assessed using *precision*, *recall*, *F1-score*, *Intersection over Union* (IoU), *mean Average Precision* (mAP), and computational efficiency. Experimental results show that the 640×640 image resolution achieved the highest detection performance, while *data augmentation* did not consistently improve model accuracy. The best performance was obtained by YOLOv8n without *data augmentation* at a resolution of 640×640 pixels, achieving an mAP@0.5 of 81.6%. These findings indicate that selecting an appropriate model architecture and input image resolution has a greater impact on detection performance than applying *data augmentation*, while also providing a favorable balance between detection accuracy and computational efficiency.

Keywords: *Diabetic Foot Ulcer*, *Wound*, YOLOv8, *Data Augmentation*, *Object Detection*, *Deep Learning*.