

**AUGMENTASI PADA YOLOv8 UNTUK MENINGKATKAN SEGMENTASI
SAMPAH MENGGUNAKAN DATASET ZEROWASTE**

SKRIPSI



**UIN SUNAN AMPEL
S U R A B A Y A**

Disusun Oleh:

**ORYZA SATIVA NUFI
09030622051**

**PROGRAM STUDI SISTEM INFORMASI
FAKULTAS SAINS DAN TEKNOLOGI
UNIVERSITAS ISLAM NEGERI SUNAN AMPEL SURABAYA
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Nama : ORYZA SATIVA NUFI
NIM : 09030622051
Program Studi : Sistem Informasi
Angkatan : 2022

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NIM 09030622051

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Skripsi oleh

NAMA : ORYZA SATIVA NUFI
NIM : 09030622051
JUDUL : AUGMENTASI PADA YOLOv8 UNTUK MENINGKATKAN
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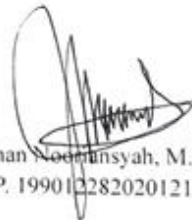
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(Bayu Adhi Nugroho, Ph.D)
NIP. 197905182014031001

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(Subhan Noorriansyah, M.Kom)
NIP. 199012282020121010

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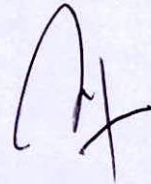
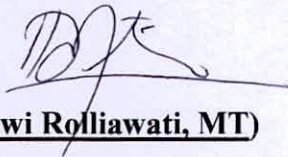
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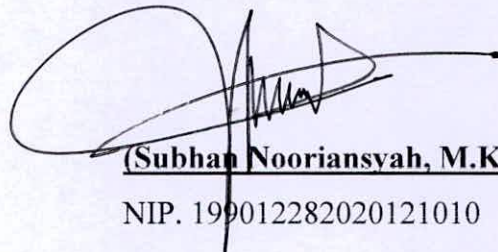
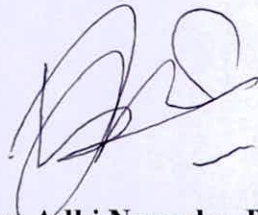
(Ahmad Yusuf, M.Kom)

NIP. 197909272014032001

NIP. 199001202014031003

Dosen Penguji III

Dosen Penguji IV



(Bayu Adhi Nugroho, Ph.D.)

(Subhan Nooriansyah, M.Kom.)

NIP. 197905182014031001

NIP. 199012282020121010

Mengetahui,

Dekan Fakultas Sains dan Teknologi

UIN Sunan Ampel Surabaya



(Dr. Asep Saepul Hamdani, M.Pd.)

NIP. 196507312000031002

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Fakultas/Jurusan : SAINS & TEKNOLOGI / SISTEM INFORMASI
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ABSTRAK

Pengelolaan sampah yang efektif memerlukan informasi yang akurat mengenai jenis dan distribusi material sampah. Salah satu pendekatan yang dapat mendukung kebutuhan ini dengan pemanfaatan computer vision berbasis deep learning untuk melakukan segmentasi objek sampah pada citra. Namun, karakteristik dataset sampah yang umumnya tidak seimbang serta keberadaan objek yang saling bertumpuk masih menjadi tantangan utama dalam meningkatkan kinerja model segmentasi.

Pada penelitian ini, kinerja YOLOv8 berbasis segmentasi (YOLOv8-seg) dianalisis dalam melakukan segmentasi objek sampah pada dataset ZeroWaste yang terdiri dari empat kelas, yaitu cardboard, metal, rigid plastic, dan soft plastic. Dua skenario pelatihan diterapkan, skenario pertama menggunakan dataset asli yang bersifat tidak seimbang dan skenario kedua menggunakan dataset yang telah diproses penyeimbangan kelas menggunakan teknik augmentasi. Selain itu, performa YOLOv8-seg dibandingkan dengan metode Mask R-CNN sebagai baseline.

Evaluasi performa dilakukan menggunakan metrik mean Average Precision pada ambang IoU 0.5 (mAP@0.5). Hasil eksperimen menunjukkan bahwa penerapan penyeimbangan data melalui augmentasi mampu meningkatkan kinerja YOLOv8-seg secara konsisten. Model yang dilatih menggunakan dataset seimbang menghasilkan performa yang lebih baik dibandingkan dengan skenario dataset asli serta menunjukkan keunggulan dibandingkan metode Mask R-CNN.

Temuan ini menunjukkan bahwa kombinasi YOLOv8-seg dengan strategi penyeimbangan data melalui augmentasi merupakan pendekatan yang efektif dalam meningkatkan akurasi segmentasi objek sampah pada citra serta berpotensi mendukung pengembangan sistem pemetaan dan pengelolaan sampah yang lebih andal.

ABSTRACT

Effective waste management requires accurate information regarding the types and distribution of waste materials. One approach to support this requirement is the application of deep learning–based computer vision for object segmentation in waste images. However, the inherent class imbalance of waste datasets and the frequent occurrence of overlapping objects remain major challenges in improving segmentation performance.

In this work, the performance of YOLOv8-based segmentation (YOLOv8-seg) is analyzed for segmenting waste objects in the ZeroWaste dataset, which consists of four classes: cardboard, metal, rigid plastic, and soft plastic. Two training scenarios are applied, the first scenario using the original dataset which was unbalanced and the second scenario using a dataset that had gone through a class balancing processed using augmentation techniques. The performance of YOLOv8-seg is also compared with Mask R-CNN as a baseline method.

Performance evaluation is conducted using the built-in YOLO metric, mean Average Precision at an IoU threshold of 0.5 (mAP@0.5). Experimental results indicate that class balancing through data augmentation consistently improves the performance of YOLOv8-seg. The model trained on the balanced dataset achieves better performance than the original dataset scenario and demonstrates superiority over the Mask R-CNN baseline.

These findings indicate that combining YOLOv8-seg with data balancing strategies through augmentation is an effective approach for improving waste segmentation accuracy in images, thereby supporting the development of more reliable waste mapping and management systems.

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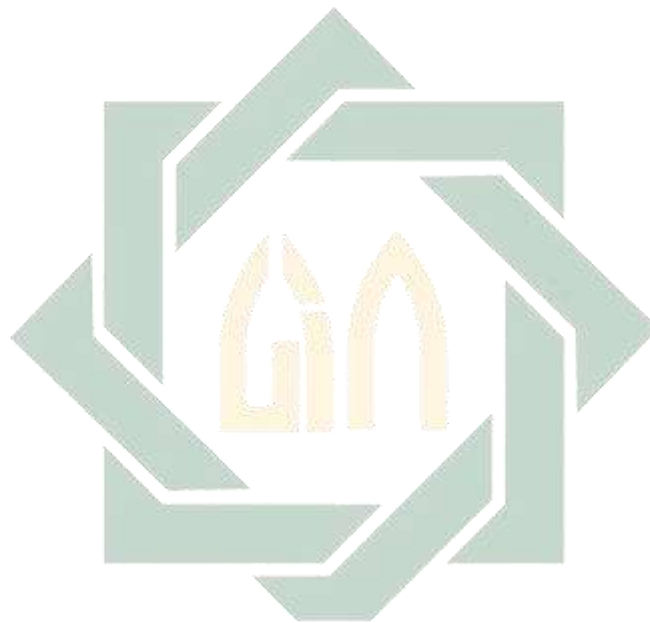
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