



UNDERGRADUATE THESIS

COFFEE LEAF DISEASE DETECTION USING YOLOV8S-P2-CBAM (CONVOLUTIONAL BLOCK ATTENTION MODULE) FOR SMALL OBJECT DETECTION

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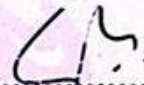
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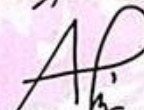
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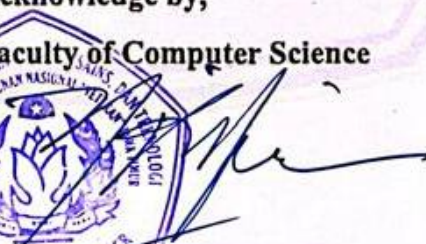
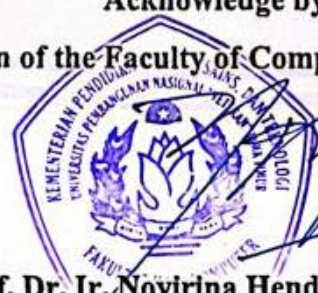

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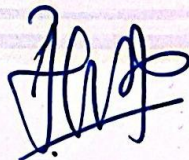
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ABSTRACT

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Coffee leaf diseases can significantly reduce coffee productivity, making early and accurate disease detection essential. However, detecting small disease lesions remains challenging because they are easily overlooked during feature extraction. This study proposes a modified YOLOv8s model, namely YOLOv8s-P2-CBAM, by integrating a high-resolution P2 detection head and the Convolutional Block Attention Module (CBAM) to improve small object detection performance.

The proposed model was trained using the enhanced BRACOL dataset with annotation refinement, data augmentation, and class balancing during the preprocessing stage. Hyperparameter tuning was conducted to determine the optimal training configuration. Model performance was evaluated using Precision, Recall, mAP@50, mAP@50-95, F1-score, confusion matrix analysis, and qualitative visualization.

The experimental results show that the proposed YOLOv8s-P2-CBAM model outperformed the standard YOLOv8s model in detecting small coffee leaf disease lesions. The best model achieved a Precision of 0.633, Recall of 0.648, mAP@50 of 0.646, mAP@50-95 of 0.353, and an F1-score of 0.640. These results indicate that the proposed architecture improves localization performance and provides a reliable approach for coffee leaf disease detection, particularly for small lesions.

Keywords: object detection, coffee leaf disease, detection head, attention, CBAM, small target.

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Surabaya, June 24th 2026

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