A SCALABLE RETINANET-CNN ARCHITECTURE FOR AUTOMATED OIL PALM BUNCH CLASSIFICATION AND DETECTION

FINAL PROJECT REPORT

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DEPARTMENT OF INFORMATICS ENGINEERING
FACULTY OF COMPUTER SCIENCE
UNIVERSITAS MERCU BUANA
JAKARTA

2025

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Submitted as one of the requirements to obtain a bachelor's degree

DEPARTMENT OF INFORMATICS ENGINEERING
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FOREWORD

Praise be to God Almighty for all His grace and blessings so that the author can complete the research proposal, which is one of the requirements for graduation from the bachelor's degree program (S1) in Informatics Engineering Universitas Mercu Buana.

The author realizes this research proposal is far from perfect because true perfection belongs only to God Almighty. Therefore, constructive suggestions and input are always welcome. And thanks to the support, motivation, assistance, guidance, and prayers of many parties, the author would like to thank:

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Finally, the author hopes that God Almighty will repay the kindness and always shower grace, guidance, and longevity on all of us, aamiin. Thank you.

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ABSTRACT

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The classification of palm oil ripeness is vital in maximizing yield and quality in the palm oil industry. This study introduces a scalable framework employing a modified RetinaNet-CNN architecture for automated oil palm bunch classification and detection. The framework emphasizes the use of deep learning techniques to achieve accurate classification, addressing the traditional reliance on manual assessments that are often subjective and labor-intensive.

By assembling a comprehensive dataset of high-resolution images of oil palm fruit at various ripeness stages, this research ensures that the training process is well-informed and applicable to real-world scenarios. The proposed model demonstrates impressive performance, achieving a mean Average Precision (mAP) of 83.6% and a high F1-score of 98.3%. Notably, the model exhibits a robust training process with a significant reduction in training loss, indicating effective learning capabilities. Additionally, the application of RetinaNet significantly reduces labor costs associated with manual grading while maintaining high classification accuracy across different ripeness stages.

The implications of this study indicate that leveraging deep learning and automated classification systems can substantially enhance the efficiency of harvesting operations in the palm oil sector. By integrating these techniques, this research contributes to advancing precision agriculture, ultimately leading to improved sustainability in palm oil production.

Keywords: RetinaNet, Convolutional Neural Networks, Palm oil, Deep learning, Automated classification.

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