

ABSTRAK

ESTIMASI WAKTU TUMBUH TANAMAN BASIL DAN SELEDRI BERBASIS *COMPUTER VISION* MENGGUNAKAN YOLOV11 PADA SISTEM HIDROPONIK VERTIKAL

(2026: xiv + 76 Halaman + 41 Gambar + 15 Tabel + 48 Daftar Pustaka + 14 Lampiran)

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Sistem hidroponik vertikal memerlukan pemantauan pertumbuhan tanaman dan kualitas air secara berkelanjutan agar tanaman dapat tumbuh optimal. Penelitian ini bertujuan menerapkan YOLOv11 untuk mendeteksi jenis tanaman dan mengestimasi umur tanaman basil serta seledri berdasarkan citra digital, sekaligus membandingkan metode *Polynomial Regression* dan *Multi-Layer Perceptron* (MLP) dalam memprediksi parameter kualitas air berupa TDS, pH, dan suhu air. Sistem dilengkapi dengan *Internet of Things* (IoT) untuk memperoleh data kualitas air secara real-time. Hasil pengujian menunjukkan bahwa YOLOv11 menghasilkan nilai Precision 96,38%, Recall 96,67%, mAP@50 98,16%, dan mAP@50–95 71,23%. Sementara itu, *Polynomial Regression* memberikan performa prediksi yang lebih baik dibandingkan MLP berdasarkan nilai R^2 , RMSE, dan MAE pada seluruh parameter yang diuji. Penelitian ini menunjukkan bahwa integrasi *Computer Vision*, *Machine Learning*, dan *Deep Learning* mampu mendukung monitoring tanaman dan prediksi kualitas air pada sistem hidroponik vertikal.

Kata kunci: Hidroponik vertikal, YOLOv11, *Computer Vision*, *Polynomial Regression*, MLP, *Internet of Things* (IoT)..

ABSTRACT

INTERNET OF THINGS (IOT) BASED WATER QUALITY MONITORING SYSTEM FOR PAKCOY PLANTS IN A HYDROPONIC SYSTEM

(2025: xiv + 76 pages + 41 pictures + 15 tables + 48 bibliography + 14 appendices)

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Vertical hydroponic systems require continuous monitoring of plant growth and water quality to ensure optimal cultivation. This study aims to implement the YOLOv11 model to detect plant species and estimate the growth stage of basil and celery based on digital images, as well as to compare the performance of Polynomial Regression and Multi-Layer Perceptron (MLP) in predicting water quality parameters, including Total Dissolved Solids (TDS), pH, and water temperature. The developed system is integrated with the Internet of Things (IoT) to collect real-time water quality data. The experimental results show that YOLOv11 achieved a Precision of 96.38%, Recall of 96.67%, mAP@50 of 98.16%, and mAP@50–95 of 71.23%. In addition, Polynomial Regression outperformed MLP in predicting all tested water quality parameters based on the R^2 , RMSE, and MAE evaluation metrics. The results indicate that the integration of Computer Vision, Machine Learning, and Deep Learning can effectively support plant monitoring and water quality prediction in a vertical hydroponic system..

Keywords: *Vertical hydroponics, YOLOv11, Polynomial Regression, Multi-Layer Perceptron (MLP), Computer Vision, Internet of Things (IoT).*