AVOCADO DISEASE CLASSIFICATION MODEL

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1 Introduction

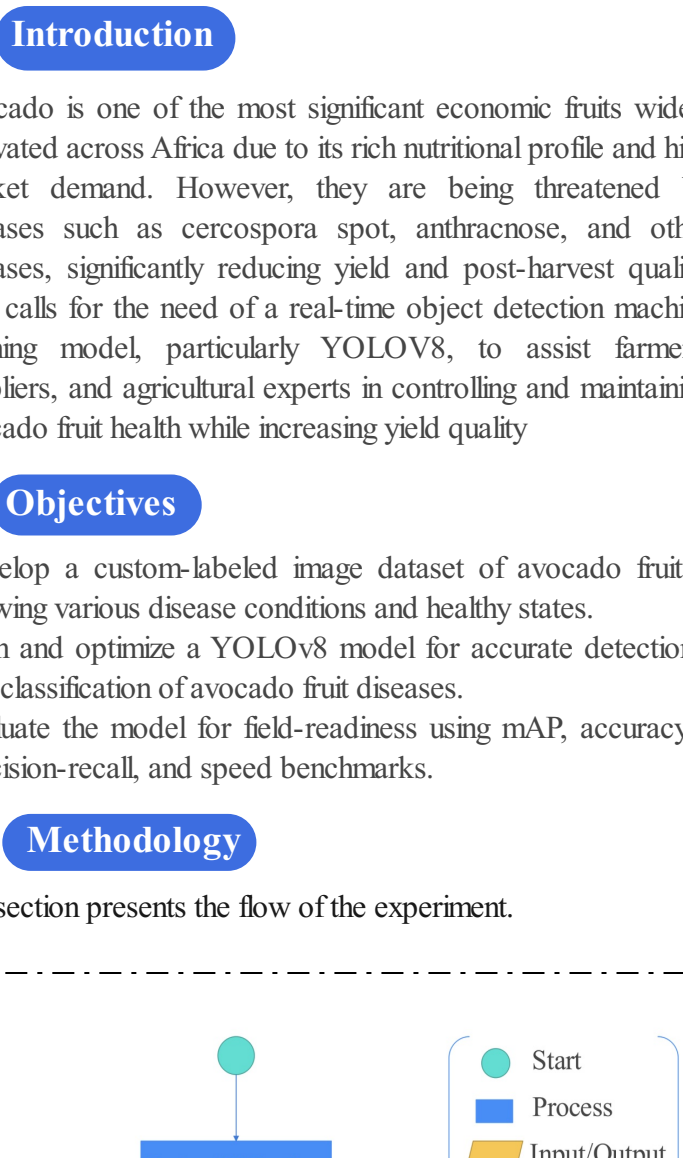
Avocado is one of the most significant economic fruits widely cultivated across Africa due to its rich nutritional profile and high market demand. However, they are being threatened by diseases such as cercospora spot, anthracnose, and other diseases, significantly reducing yield and post-harvest quality. This calls for the need of a real-time object detection machine learning model, particularly YOLOV8, to assist farmers, suppliers, and agricultural experts in controlling and maintaining avocado fruit health while increasing yield quality

2 Objectives

- Develop a custom-labeled image dataset of avocado fruits showing various disease conditions and healthy states.
- Train and optimize a YOLOv8 model for accurate detection and classification of avocado fruit diseases.
- Evaluate the model for field-readiness using mAP, accuracy, precision-recall, and speed benchmarks.

3 Methodology

This section presents the flow of the experiment.



Figurer 1: Flowchart of the entire process

a) A custom dataset was collected from online with high resolutions comprising of 5000 images.
b) The dataset has 5 classes with each class having 1000 images.
c) The dataset was manually labeled using and export to yolo format.
d) The dataset were split in to train (70%), validation (20%), and test (10%).
e) Four yolo models were trained as follows;
   Yolov8n - baseline model
   Yolov10n - Next generation yolo model
   Yolov11 - Experimental yolo model
   Yolov8n_Op - Optimized yolov8n model
f) Each model was trained with consistent hyperparameters where applicable, including learning rate, batch size, and number of epochs. GPU acceleration was utilized for efficient training

4 Results

The results obtained from the experiment are presented in this section.

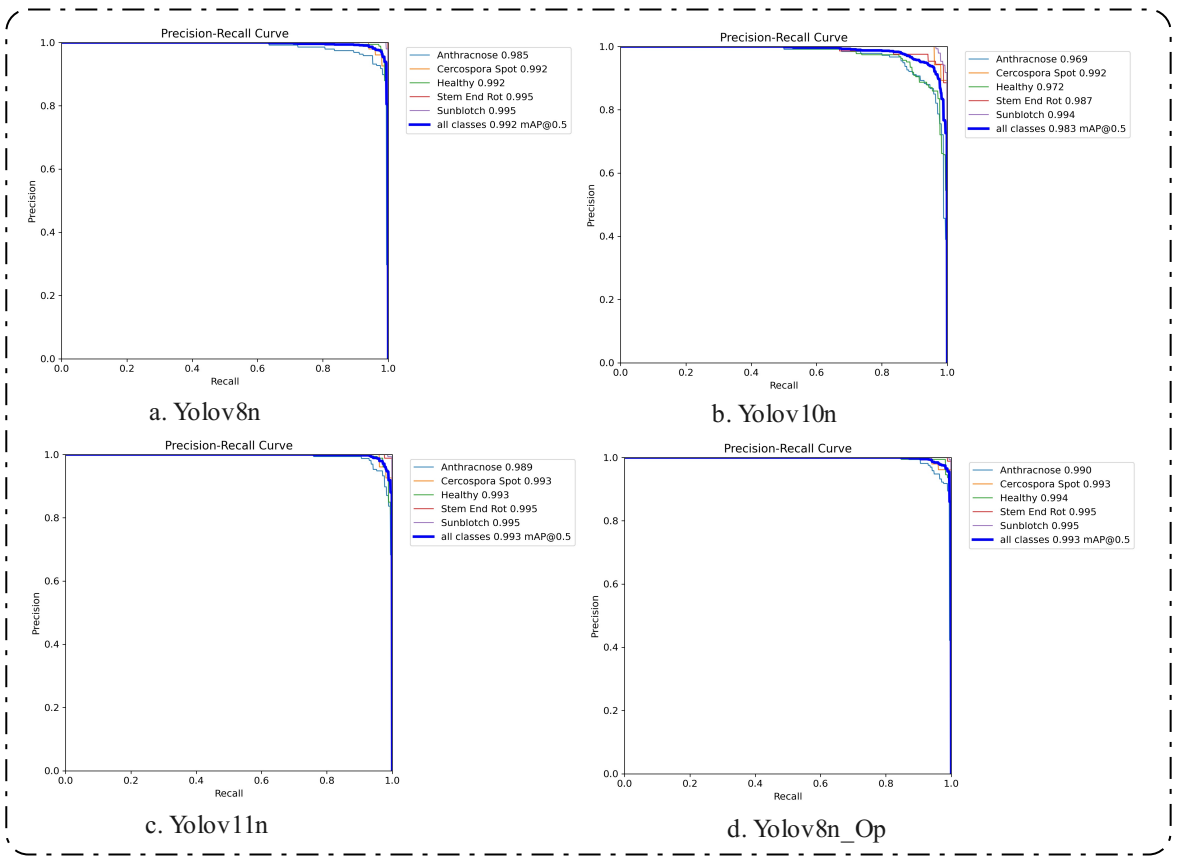


Figure 2. Precision - Recall curves comparison.

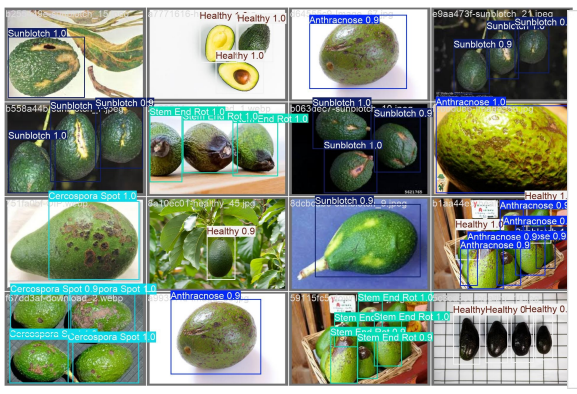


Figure 3. Prediction and Classification Results

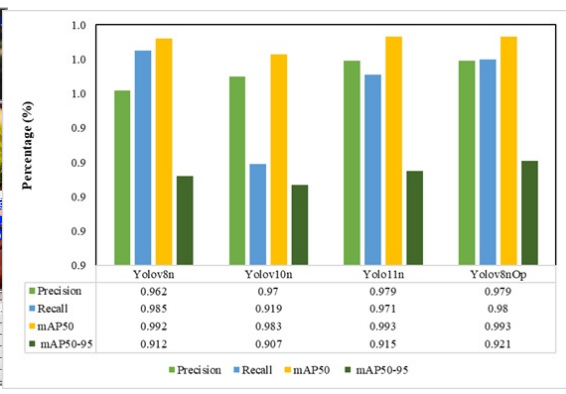


Figure 4. Benchmark of the trained models

5 Conclusion

- The evaluated object detection model demonstrates excellent performance, achieving high precision and recall across all classes.
- The optimized yolov8n models outperforms the selected models for this experiment.
- These results validate the model's suitability for real-world deployment in tasks such as disease detection or agricultural monitoring. Further enhancements may focus on optimizing inference speed or extending to additional classes.

6 Reference

[1] Thangaraj, R., Dinesh, D., Hariharan, S., Rajendar, S., Gokul, D., & Hariskarthi, T. R. (2020). Automatic recognition of avocado fruit diseases using modified deep convolutional neural network. International Journal of Grid and Distributed Computing, 13(1), 1550-1559.

[2] Mishra, S., Ayane, T. H., Ellappan, V., Rathee, D. S., & Kalla, H. (2022). Avocado fruit disease detection and classification using modified SCA–PSO algorithm-based MobileNetV2 convolutional neural network. Iran Journal of Computer Science, 5(4), 345-358.