PMW: Application of Image Processing in Detecting Pineapple Mealybug Wilt

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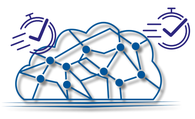
PROBLEM

Uninfected pineapples that are at risk of contracting the Pineapple Mealybug Wilt-associated Virus (PMWaV)

The ways of detection to identify infected pineapple

Farmers struggle with the time and cost of manually identifying PMWaV, leading to delayed detection and potential crop loss



AI image processing detects PMWaV early, saving time and reducing costs by preventing widespread infection and minimizing manual monitoring

Burning infected crops is a common method, but it depends on the size of the area affected by PMWaV

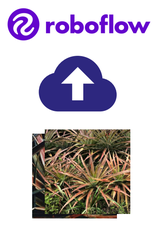
Early detection and intervention can protect crops and prevent further spread

FRAMEWORK

1

Find related research and examples of diseased and healthy pineapples

2

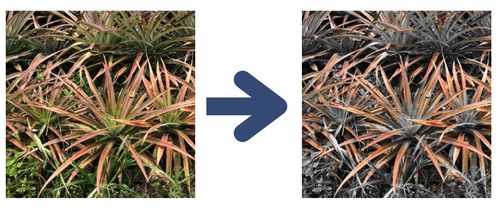


Upload the datasets to Roboflow for processing and analysis

3

Label the images to prepare them for training the models

4



Preprocess the datasets using our algorithm and imgaug library

5

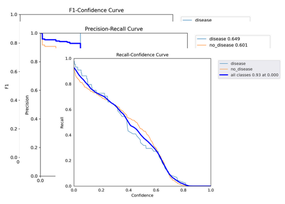
YOLOv8

YOLOv9

YOLOv10

Select the appropriate models for training

6



Evaluate the models to assess their performance and accuracy

7

roboflow

YOLOv8

YOLOv9

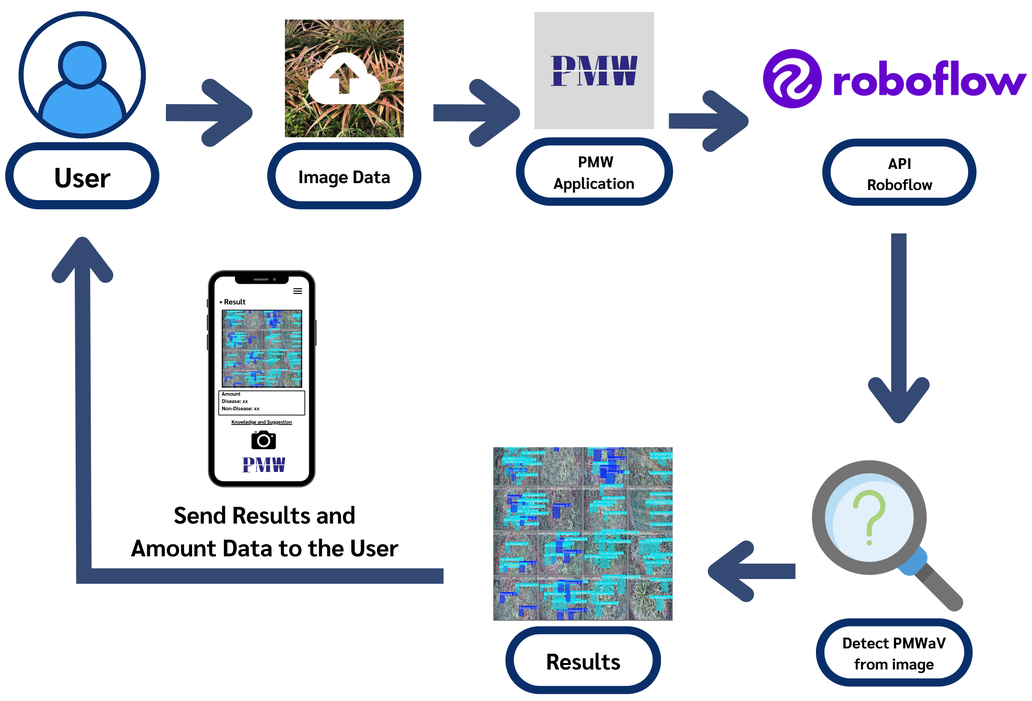
YOLOv10

Develop and deploy detection models

8

Design and develop an application PMW for detection

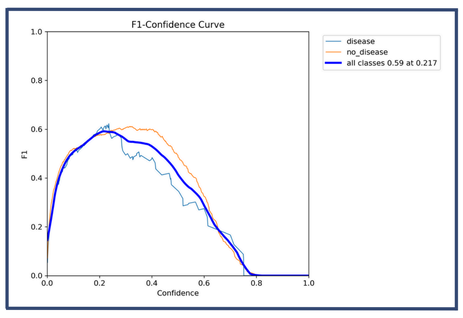
Flowchart



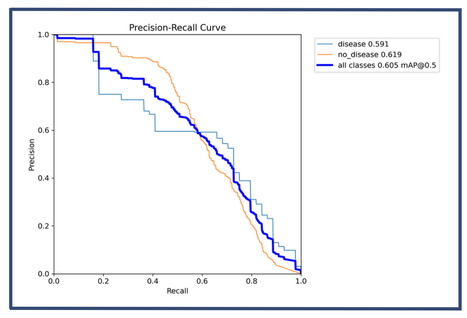
This flowchart shows the process and performance of the PMW application

FINDING

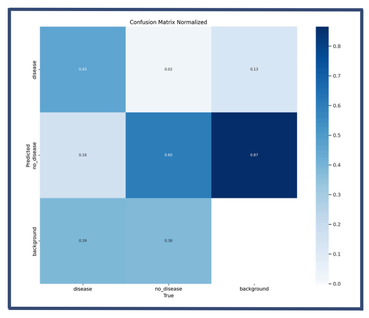
YOLOv8 F1 Score



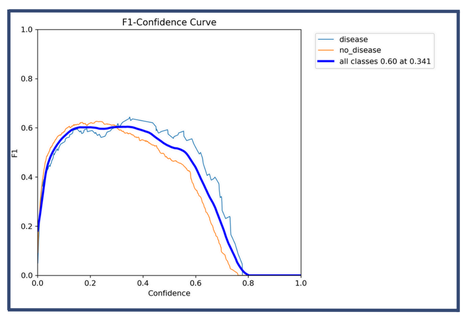
YOLOv8 Precision-Recall Score



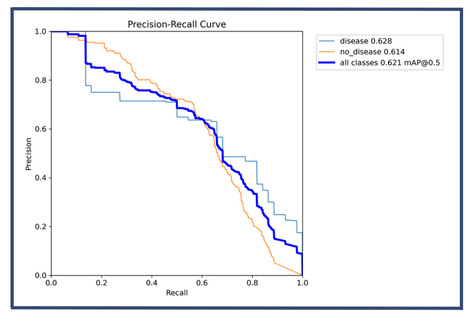
YOLOv8 Confusion Matrix



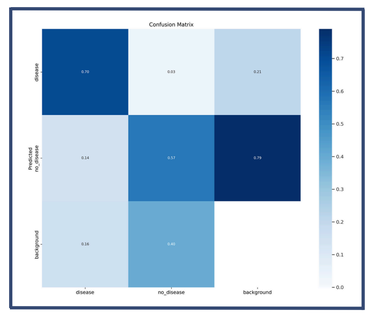
YOLOv9 F1 Score



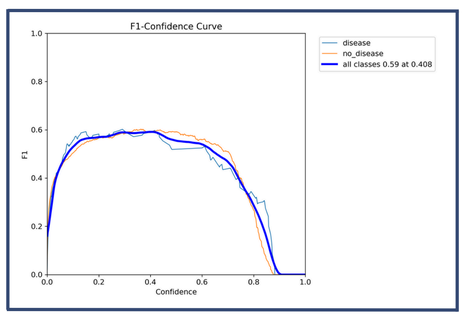
YOLOv9 Precision-Recall Score



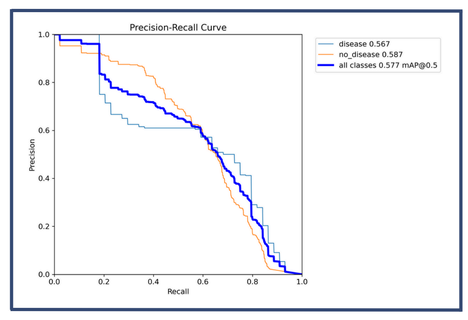
YOLOv9 Confusion Matrix



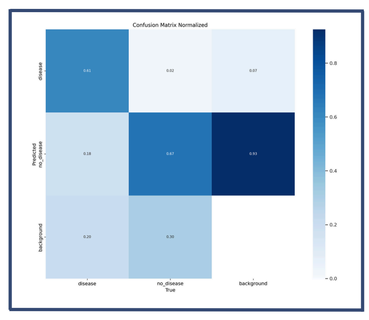
YOLOv10 F1 Score



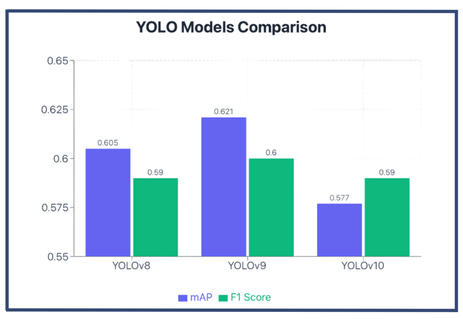
YOLOv10 Precision-Recall Score



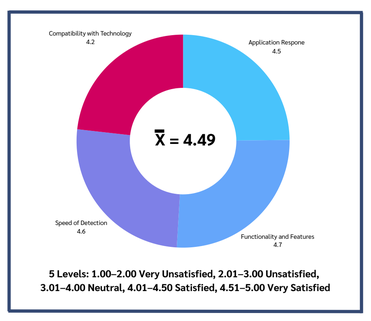
YOLOv10 Confusion Matrix



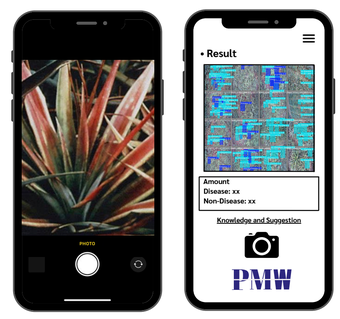
Models Comparison



User Satisfaction



GUI Program



CONCLUSION

The "Application of Image Processing in Detecting Pineapple Mealybug Wilt" project effectively combats PMWaV, a major threat to pineapple crops in Thailand. The application, utilizing advanced image processing and deep learning techniques, achieved a 62.5% mean average precision (mAP) accuracy in detecting wilt disease. With a satisfied user satisfaction rating of 4.49 out of 5.00, the application demonstrates both its precision and practical utility, offering a valuable tool for improved disease management and reduced economic losses in pineapple cultivation.

REFERENCES

[1] YOLOv8 (2024). Object Detection, Searched on August 25, 2024 from. https://arxiv.org/abs/2305.09972

[2] YOLOv9 (2024). Computer Vision, Searched on August 25, 2024 from. https://arxiv.org/abs/2402.13616

[3] YOLOv10 (2024). Real-Time End-to-End Object Detection, Searched on August 25, 2024 from. https://arxiv.org/abs/2405.14458

[4] Rethinking Transformer in Vision through Object Detection (2021). Object Detection, Searched on August 25, 2024 from. https://arxiv.org/abs/2405.14458

[5] Detectron2 Implementation and Demonstration with Hyper Suprime-Cam Data (2023). DeepDISC Searched onAugust 25, 2024 from. https://arxiv.org/abs/2307.05826

[6] Pineapple Wilt (2023). Pineapple disease, Searched on August 25, 2024 from. https://edoae.doae.go.th/articel_200415.pdf