SUPPLEMENTARY I

PERFORMANCE COMPARISON BETWEEN THE AVERAGING AND MAJORITY VOTING TECHNIQUE

In this work, the majority voting technique, named majority voting of bounding boxes (MVB), is proposed for the classification of apple leaf diseases and skin diseases. To demonstrate the superiority of the majority voting technique, another common ensemble technique or the averaging technique (AVG) is selected to compare with MVB. To aggregate confidence scores of all bounding boxes identified in an image, the AVG method predicts the image based on the average confidence scores of each class label. The class label that has the highest average confidence score is given as a predicted class for the image.

Table S1 illustrates the performance comparison between the AVG method and MVB method in the classification of apple leaf diseases. The results show that the performance scores of Fast-RCNN with AVG are equivalent to those of Fast-RCNN with MVB. For Faster-RCNN and YOLOv5, the performance of MVB outperforms those of AVG with all performance scores of greater than 99%. Thus, the proposed method, object detection models with MVB, exhibits higher performance scores, including precision, recall, F1, and accuracy, than those of AVG in classifying apple leaf diseases.

TABLE S1. PERFORMANCE COMPARISON BETWEEN THE AVERAGING (AVG) AND MAJORITY VOTING OF BOUNDING BOXES (MVB) TECHNIQUE IN THE CLASSIFICATION OF APPLE LEAF DISEASES.

Classification Performance	Fast-RCNN		Faster-RCNN		YOLOv5	
	AVG	MVB	AVG	MVB	AVG	MVB
Precision	1.00	1.00	0.98	1.00	0.93	0.99
Recall	1.00	1.00	0.98	1.00	0.91	0.99
F1	1.00	1.00	0.98	1.00	0.91	0.99
Accuracy	1.00	1.00	0.98	1.00	0.91	0.99

Table S2 demonstrates the performance of the AVG and MVB method in the classification of skin diseases. The results show that all object detection models with the MVB outperform the AVG method, no matter which performance scores are considered. Especially, Faster-RCNN and YOLOv5 with MVB achieve all performance scores of 87%, substantially enhancing the performance scores of Faster-RCNN and YOLOv5 with AVG. In summary, the MVB technique is more suitable for the classification of apple leaf diseases and skin diseases than the AVG technique.

TABLE S2. PERFORMANCE COMPARISON BETWEEN THE AVERAGING (AVG) AND MAJORITY VOTING OF BOUNDING BOXES (MVB) TECHNIQUE IN THE CLASSIFICATION OF SKIN DISEASES.

Classification Performance	Fast-RCNN		Faster-RCNN		YOLOv5	
	AVG	MVB	AVG	MVB	AVG	MVB
Precision	0.80	0.84	0.86	0.87	0.82	0.87
Recall	0.79	0.83	0.85	0.87	0.77	0.87
F1	0.78	0.83	0.85	0.87	0.76	0.87
Accuracy	0.79	0.83	0.85	0.87	0.77	0.87