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# PHALAENOPSIS SEEDLING ASSESSMENT USING LEAF CONTOUR DETECTION WITH YOLO

**Yung-Chi Hu[1], Jui-Hsiang Shao[1], Shu-Jen Lee[2] , Yan-Fu Kuo[1*]**

[1] Department of Biomechatronics Engineering, National Taiwan University, Taipei, Taiwan.
[2] Taoyuan District Agriculture Research and Extension Station, Ministry of Agriculture, Taoyuan, Taiwan.

*Corresponding Author: ykuo@ntu.edu.tw

## ABSTRACT

In this study, we propose a vision-based approach for automatically measuring the morphological traits of Phalaenopsis seedlings. By utilizing top-view and side-view images, our method automatically extracts leaf contours to replace traditional manual measurements. A YOLOv8n-seg model was employed to segment the seedlings, and further correction strategies were introduced to improve accuracy. Experimental results demonstrate the potential of our approach to support large-scale seedling classification and reduce labor cost.

**Keywords:** Phalaenopsis seedlings, Leaf morphology, Plant phenotype, Computer vision

## INTRODUCTION

Phalaenopsis seedlings are one of the major export products in Taiwan. In 2023, over 60 million seedlings were exported, with a production value of approximately 150 million USD. Before export, seedling classification is usually conducted manually based on morphological traits such as leaf width and plant length. However, manual measurement is time-consuming and labor-intensive. Recently, deep learning-based segmentation has emerged as a promising solution for automating plant phenotyping. In this work, we aim to establish an automatic pipeline to extract key morphological seedling traits using image-based analysis.

## MATERIALS AND METHODS

### PHALAENOPSIS IMAGE ACQUISITION AND MODEL TRAINING

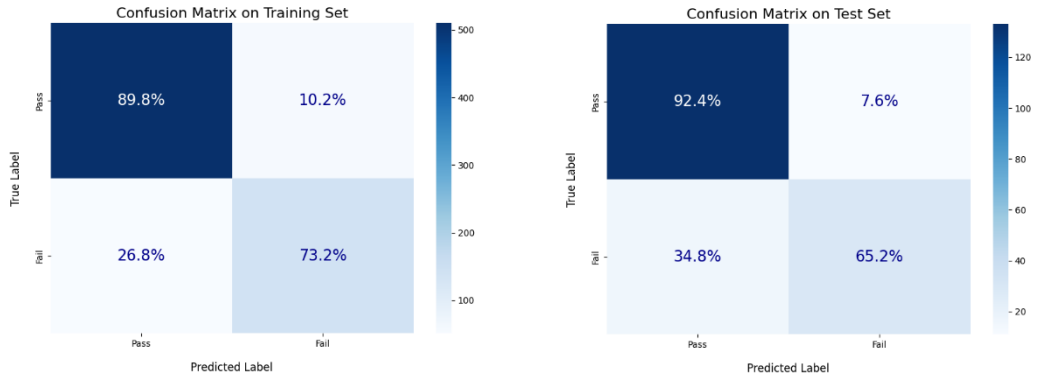
A total of 243 and 234 top-view and side-view images were used to train two YOLOv8 segmentation models, one for each view. The models extract leaf contours, which are then applied to estimate plant length and width.

## MORPHOLOGICAL TRAITS ESTIMATION

For trait prediction, top-view and side-view models were tested on two different sets of images. We use a bounding box to enclose the leaf in the top-view image for plant width and leaf width estimation. For leaf length estimation, the contour from side-view images was fitted with a polynomial curve. Plant length estimation combined leaf length from side-view images and bounding box length from top-view images as inputs to a linear regression model, thereby improving measurement accuracy. To reduce viewpoint-induced errors, leaf width was also incorporated into the regression model. The estimated length and width serve as the basis for determining whether the seedling meets the export criteria.

## RESULTS & DISCUSSION

Figure 1 shows the classification results for determining whether the seedlings met the export criteria. The recall and precision were 90.9% and 89.8% on the training set, and 89.3% and 92.3% on the test set, respectively.




(a) (b)

Fig.1 Confusion matrix of (a) training set and (b) testing set..

## CONCLUSIONS

This study presents a computer vision-based method for automatic measurement of Phalaenopsis seedling traits. The model achieved F1-scores of 90.3% and 90.8% on the training set and test set, respectively. The results demonstrate the potential of integrating computer vision into Phalaenopsis seedling classification to enhance the efficiency in the exporting industry.