



Ensemble Deep Learning Approach for Apple Fruitlet Detection from Digital Images

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Agriculture commodities are commodities that have a high economic worth and the potential to be developed further. The green and red apple, in instance, is one type of fruit that has the potential to be cultivated as part of agriculture. In most cases, the sorting of green apples is done manually, and individuals are the ones who make the final determinations. The process of manually identifying products can have several drawbacks, including the fact that it takes a considerable amount of time, the fact that humans can become fatigued and overworked when performing repetitive tasks, the fact that there is less variety in the products that can be identified, and so on. As a result of developments in science as well as digital image processing technology, it is now possible to automatically categorizing agricultural products and plantings. The purpose of this research is to enhance the performance of the CNN-based model in detection of apple fruitlet from apple tree images. A dataset containing 720 images of apple fruitlet is used in this project. To enhance the overall performance of the model, the revised CNN-based YOLOv5 ensemble model was implemented with the Sigmoid Linear Unit (SiLU) activation function, Batch Normalization, and SGD optimization algorithms. The combination of activation function, optimization, batch normalization, and ensemble technique are later used to enhance the YOLOv5 ensemble model with the benefits of utilizing limited resources. According to the experimental results, the accuracy of the updated ensemble model achieved 95% percent of accuracy in terms of Mean Average Precision (MAP) when compared to the benchmark model.

Keywords: Ensemble Deep Learning; CNN-based model; Detection

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