Crop pest recognition using Image Processing

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Inspiring Excellence

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Abstract

Pests infestation is the biggest threat for the agriculture sector. It can cause various types of diseases in crops and reduce crop production. As a result, it is necessary to detect pests early and take necessary steps to stop the infestation. For decades, humans used traditional manual techniques to detect pests. However, this technique is very time consuming, laborious and less accurate. The aim of this study is to propose an approach is to use machine learning to detect pest insect accurately and fast to pest infestation.

Research Objective

- To collect a secondary dataset for our research purpose.
- To implement state of the art algorithms in pest recognition to detect and classify harmful pests.
- To compare the accuracy of state of the art algorithms with each other.

Dataset

We used a secondary dataset IP102 which is one of the biggest insect pest dataset that is publicly available for academic usage . This dataset contains more than 75,000 images of 102 categories of insects. We used 10 largest classes from this dataset for insect pest detection. 17926 images were used for training the model. The sample image of the dataset is in fig.01.

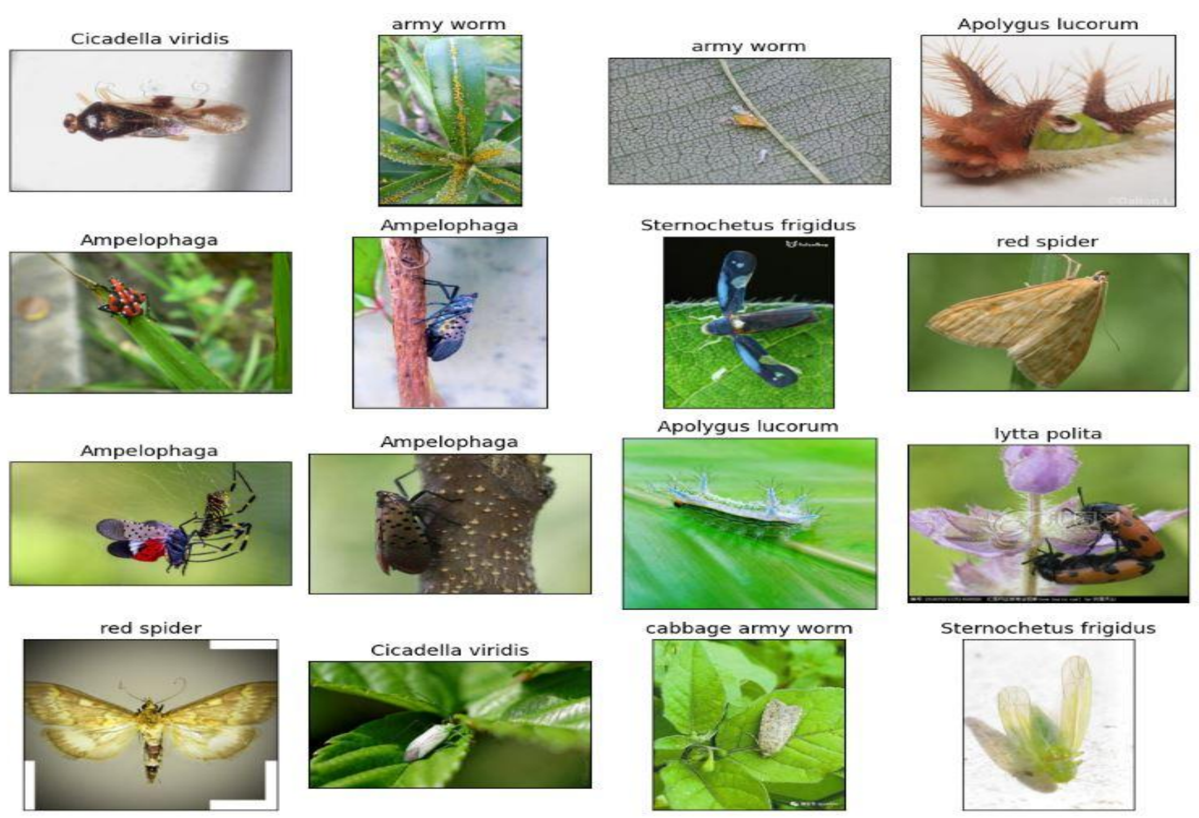


Fig.01. Sample Image of IP102

Data Pre-processing

Data augmentation is a technique where it creates new image data from the existing image data. Deep learning models need large amounts of data to predict anything perfectly. Hence, it was proved that augmentation has a great importance in image classification due to insufficient image data. The categories of IP102 dataset are unbalanced. So, we use data augmentation to balance the data of the categories. There are some common techniques in data augmentation that can increase data without creating an overfitting problem. The techniques are rotation , flipping , zooming and scaling etc. We used a vertically and horizontally shifting technique and a zoom in and out technique within 0.8 to 1 range and shifting the color channel technique.

Proposed Models

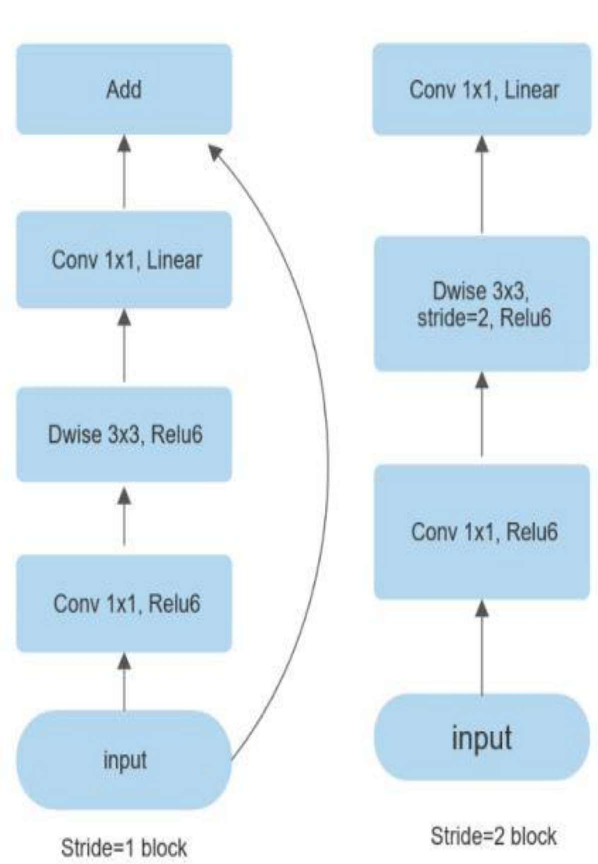


Fig.02. Mobilenet V2

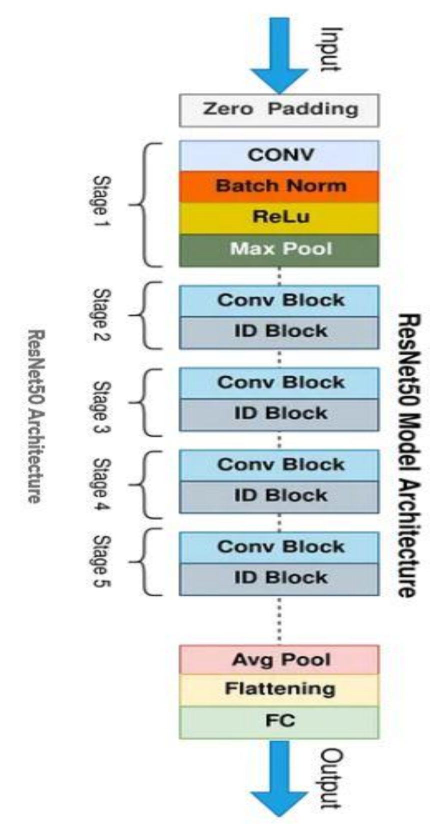


Fig.03. Resnet 50

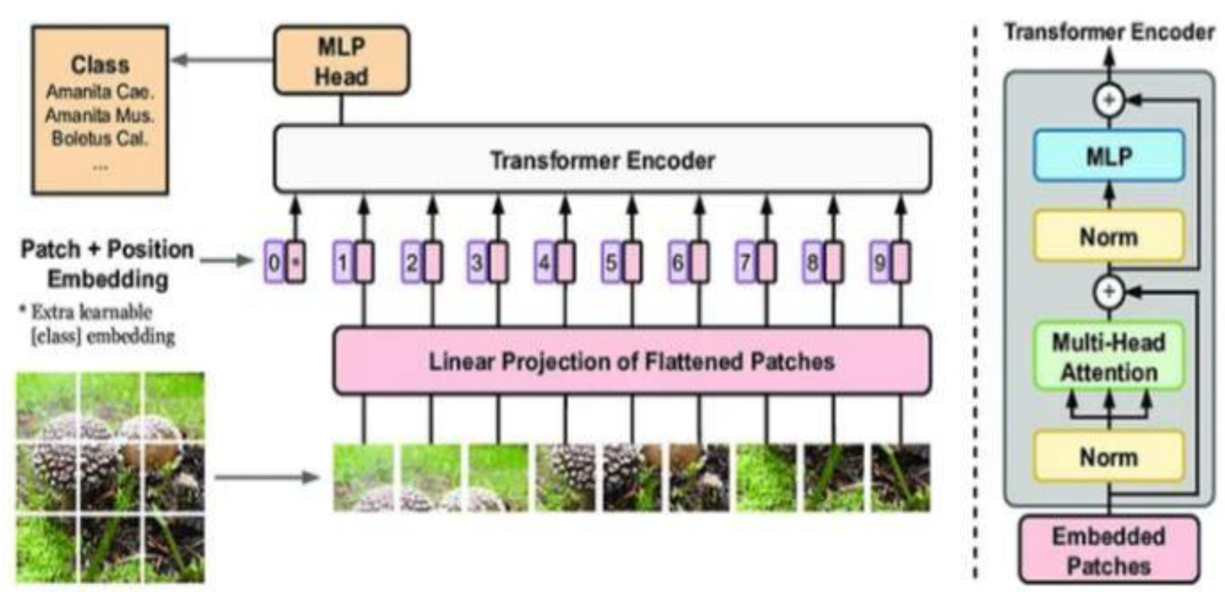
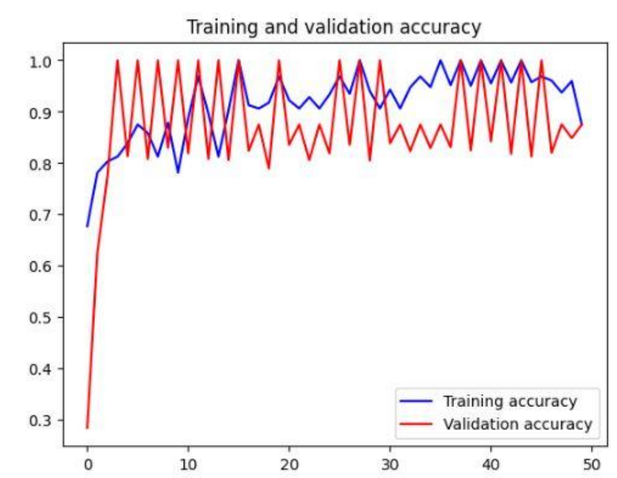
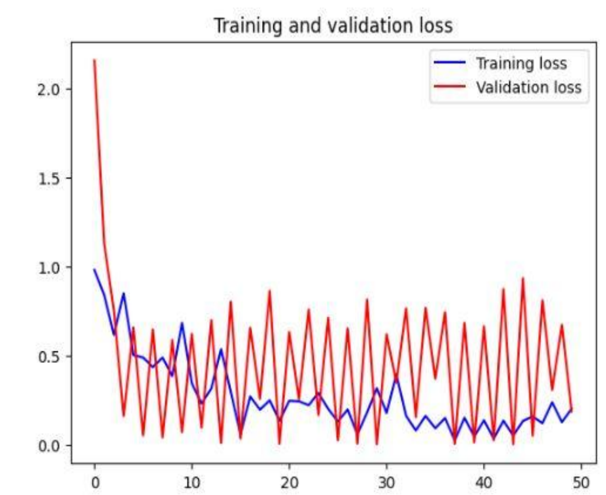


Fig.04. Vision Transformer

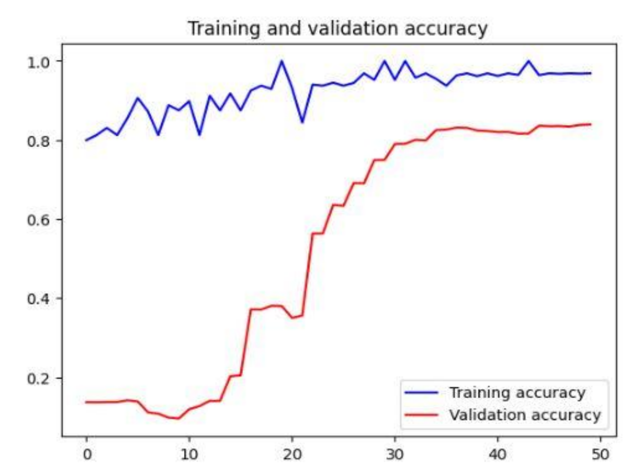
Model Analysis

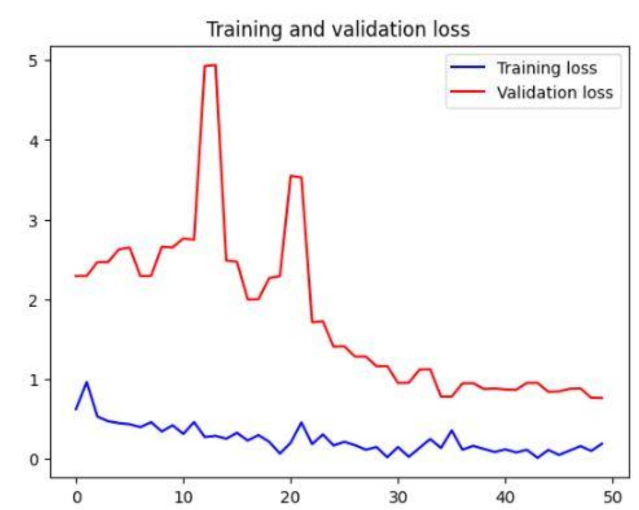
Resnet 50



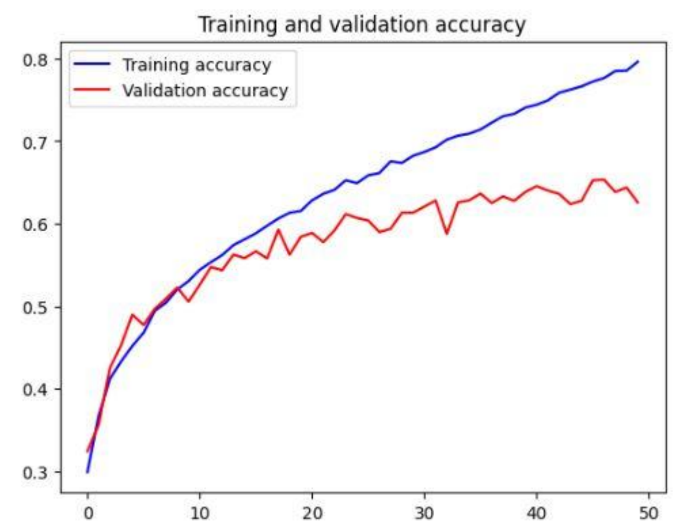


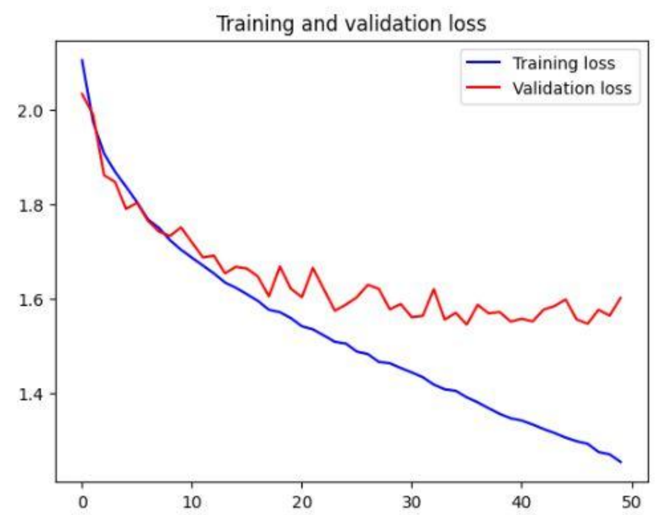
Mobilenet V2





Vision Transformer





Model name	Accuracy	Validation accuracy
Mobilenet V2	97.50%	83.9%
Resnet 50	95.5%	82%
Vision Transformer	79.16%	62.19%