Pest Classification and Detection Using DeepLearning

[1]NIKITHA.K.S, [2]GAGAN PURUSHOTHAM, [3]CHANDAN.R, [4]HRISHIK.B.S, [5]POORVIK.D.G

[1]Assistant Professor,[2,3,4,5]Student
Bangalore Institute of TechnologyBangalore

Abstract: India GDP (Gross Domestic Product) is mainly based on agricultural and high quality crop production plays a very important role. Frequent attacks of pests cause a serious damage to crops, by reducing their yields, and also decrease the nutrients in food products which pose a great threat to food. Safety. This in turn will have a major impact on our economy; farmers will suffer enormous losses due to these issues we have to sacrifice many farmers life. Regular monitoring of the crops is very important to take appropriate measures on pests on time by using appropriate pesticide and further protect the crops from damage. Pest detection would really help the farmers to avoid the early defilement of crops by using pesticide. Artificial intelligence plays an important role in solving huge problems in agriculture field thus farmers will benefit from AI-based technologies to boost agricultural production. In this paper we consider Mobile Net V2 algorithm to classify the pest to different classes by reshaping the image, extracting the features of pest classifying according to their respective classes. The result proves that Mobile Net V2 performs better with a higher accuracy (0.85) when compared to other pre-trained models.

INTRODUCTION

Agriculture is the primary source of livelihood for about 58% of India's population. Gross Value Added by agriculture, forestry, and fishing was estimated at Rs. 19.48 lakh crore in FY20.The percentage share of GVA of Agriculture and Allied Sectors (at current prices) is 18.8% of the total GVA. Consumer spending in India will return to growth in 2021 post the pandemic-led contraction, expanding by as much as 6.6%. Pest and weeds that cause mass crop failures and lead to market for the final product is weak. Finding new ways to make money even small increases in efficiency can make a difference between turning them into profit or loss. Gotta take care of it the attack of pests on crops affects the growth of the field harvest. Essential food crops mainly contribute to bulk production. Insects are the main causes loss of crop quality and hence crop yield. Many AI Techniques are applied in monitoring of crop and soil, fruit grading, plant disease detection, insect pest recognition, and detection. Many developments have been made in the agriculture sector, using machine learning to detect and classify the insects under stored grain conditions. Fruits and vegetables quality evaluation performed using computer vision-based quality inspection comprising four main steps, such as acquisition, segmentation, feature extraction, and classification. Therefore, monitoring and assessment of damage caused by insects is necessary to ensure that crops quality and safety in agriculture. In this paper, we will pre-process the image then train the CNN model using the features that has been extracted and then predict the images by classifying the pest.

RELATED WORKS:

In recent time AI Technique is being given a huge importance by the researchers in image classification, starting from image classification to suggestion of pesticide. Researcher around the globe supporting in agriculture sector development also they have proposed different methods for early detection of pest detection through several ways. Jayme Garcia Arnal Barbedo have developed CNNs have been used for detecting and counting moths in traps. The system employed a sliding window and, for each image patch, where authors claimed that CNN output a probability for the presence of a moth. Hong Zeng, have developed the automatic extraction, analysis, and understanding of useful information from a single image or a sequence of images using computer vision. where the faster R-CNN output will predict every anchor being object or background. It resulted in a 10x increase in inference speed and better accuracy. The authors found their proposed system is more efficient to get higher accuracy when compared to other traditional ML algorithms. Then mozhi Kasinathan, have that was evaluated and compared with pre-trained deep learning architectures such as Alex Net, ResNet, Google Net and VGG Net for insect classification. The data augmentation techniques such as reflection, scaling, rotation, and translation are also applied to prevent the network from overfitting. The effectiveness of hyperparameters was analysed in the proposed model to improve accuracy.

METHADOLOGY:

The dataset used in this paper is IP102 dataset, where there are around 75000 images in the dataset. The dataset consist of images of different classes of pest and each pest is different from other depending on their feature they are segregated into different classes. The train and test part are segregated of 80 and 20 percent also we consider, 4 classes of pest in each class 200 images are trainned. Fig 1 shows some of the pest images from IP102 dataset.

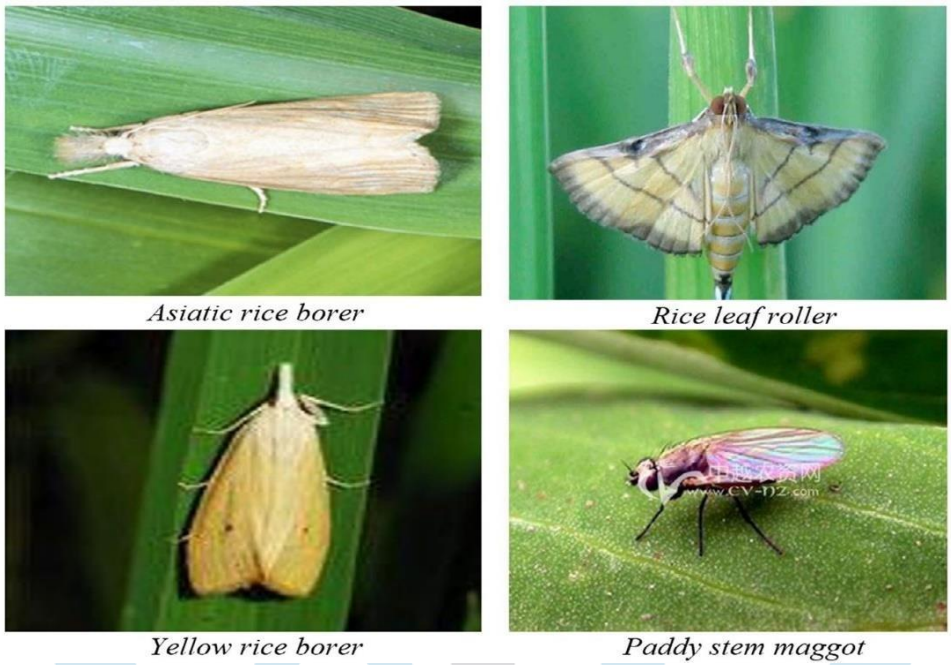


Figure1: Dataset of the Pests

The below architecture fig 2 represents the flow of the classification, detection of pest and also suggest appropriate pesticide this would make the farmers use the technology that is available to identify the pest and avoid the loss of crops in early stages. The pre-processing step would reshape the image that has been uploaded from the given dataset later the feature extraction of the pest such as length, width, area is done. The next is training phase using MobileNet V2 then when it comes to the testing part the pest will be classified and result would be detected.

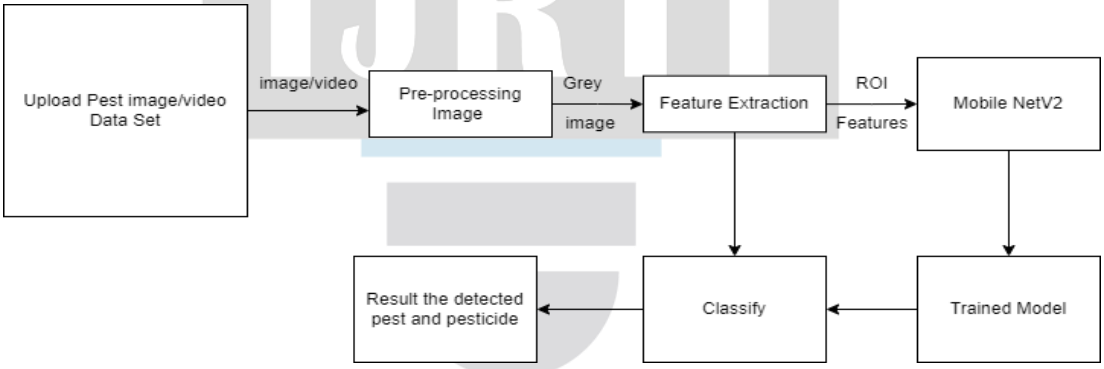
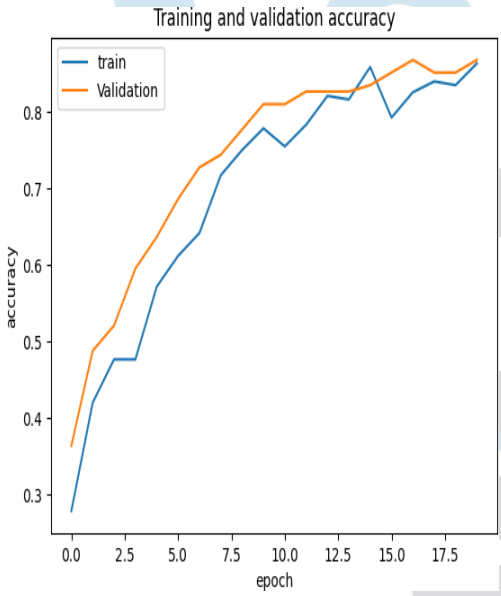


Figure2: Architecture of Pest Classification and Detection

EXPERIMENTAL RESULTS:

The dataset was downloaded from IP102 which was available online publicly among 22 classes present we considered 4 classes and in each class 200 images were stored to the system. MobileNet v2 model was used to test and validate the dataset to classify and predict the pest, suggest the pesticide, climatic conditions. The training and testing data was divided 80 and 20 percent partition of the data finally the pest will be predicted in the test state the below fig 3 represents the output with suggested pesticide to avoid the pest in crops also the climatic condition in which the pest can survive. The below fig 4 and 5 represents the training and test accuracy,loss.

Figure 3: Prediction of Rice Leaf Roller



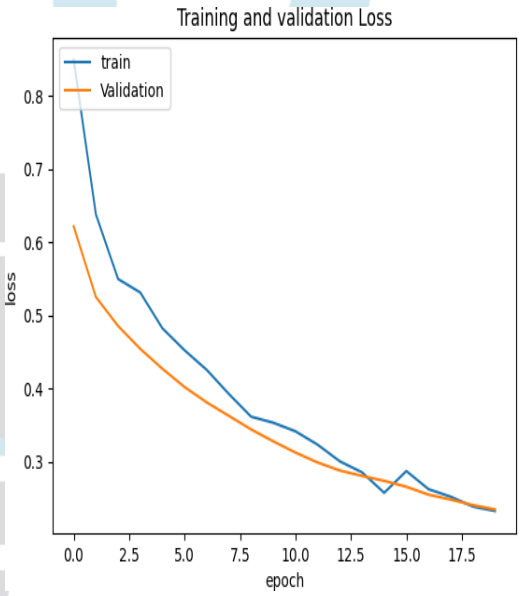


Figure 4: Result of Training and Validation AccuracyFigure 5: Result of Training and Validation Loss

CONCLUSION:

In this paper, we consider five classes different pest were classified and detected by applying the machine learning techniques and the suggestion of pesticide. All the insect images were reshaped, pre-processed to improve the accuracy we have used MobileNet V2. Achieving the insect classification with higher accuracy in the real-time field is a challenging issue in the presence of shadow, leaves, dirt, etc. in major agriculture field crops. Thus, it is important that the farmers keep monitoring the crops and growth of pests on a regular basis to check any early sign of damage. Artificial Intelligence is a rising revolution in agriculture which is helping the farmers to address the major problems in agriculture efficiently. In a country like India we require these kind of technology to avoid the degradation of crops and stand behind farmers to achieve a successful production of food to feed a large population. In future, by using different machine learning algorithms the characteristics of pest and prevention would be detected that would help the farmers to easily understand how to avoid the damagein a better way.

References:

[1] "Detecting and Classifying Pests in Crops Using Proximal Images and Machine Learning", Jayme Garcia Arnal Barbedo, Embrapa Agricultural Informatics, Campinas, MDPI, 2020.

[2] "Application of Deep Learning in Integrated Pest Management: A Real-Time System for Detection and Diagnosis of Oilseed Rape Pests", Yong He, Hong Zeng, Yangyang Fan, Shuaisheng Ji, Jianjian Wu, Hindawi,2019.

[3] "Plant diseases and pest detection based on deep learning", Jun Liu, Xuewei Wang, BMC, 2021.

[4] "Insect classification and detection in field crops using modern machine learning techniques", Thenmozhi Kasinathan, Dakshayani Singaraju, Srinivasulu Reddy Uyyala, KeAi, 2020.

[5] "Shallow and Deep Learning Architecture for Pests Identification on Pomelo Leaf ", Quoc Bao Truong ,Tan Kiet Nguyen Thanh, Minh Triet Nguyen, International Conference on Knowledge and Systems Engineering (KSE), 2018.

[6] "Detection Of Vegetation Areas Attacked By Pests And Diseases Based On Adaptively Weighted Enhanced Global And Local Deep Features", Yanshuai Dai, Li Shen, Yungang Cao, Tianjie Lei Wenfan Qiao , IEEE, 2019.

[7] "Crop pest classification based on deep convolutional neural network and transfer learning", K. Thenmozhi, U. Srinivasulu Reddy, Elsevier, 2019.

[8] "Crop Diseases and Pests Detection Using Convolutional Neural Network", Pruthvi P.Patel, Dineshkumar B. Vaghela, IEEE, 2019.

[9] "An Image Recognition Algorithm of Soybean Diseases and Insect Pests Based on Migration Learning and Deep Convolution Network", Mingyuan Xin, Yong Wang, IEEE, 2020.

[10] "Insect classification and detection in field crops using modern machine learning techniques", Thenmozhi Kasinathan, Dakshayani Singaraju, Srinivasulu Reddy Uyyala, China Agricultural University,2020