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A SURVEY ON -APPLE, GRAPE, CUCUMBER LEAF DISEASE DETECTION AND CLASSIFICATION

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Abstract

Agricultural is very important in india.Plant leaf diseases severely effects the profits of crops. Small chemical changes in crops lead to a shortage of food. In addition apples and grapefruits are also susceptible to a number of diseases. Apple trees mostly suffer from some diseases such as Scab, Black rot, and Cedar rust diseases, and Grape plants go through from Black Measles, Black rot, and Leaf Blight diseases. Cucumbers are most important vegetable in salads. And it is also good for health. But Cucumbers suffer from Angular leaf spot, Anthracnose, blight, Downy mildew, and powdery mildew diseases. Quality and quantity is severely reduced by leaf diseases. So if we need to Detecting and diagnosing diseases early stages it gives most success rate of production of Apples, Grapes, and Cucumbers. By reducing severity of leaf diseases in early stages by the presence of farmers or plant pathologists. But Manual diagnosis of disease may lead to misidentification and inappropriate use of pesticides and also consumes a lot of time. Because of these drawbacks we choose artificial ways to classifying diseases. Many classification techniques have been proposed such as VGG-16, AlexNet, Inception, Resnet.But still they are having difficulties such as noise, redundant features, and extraction of relevant features. So by removing all drawbacks we propose new architecture called Squeeze Net.

Keywords: Alex net, Squeeze net, VGG-16 Network, Resnet,Inception

1. Introduction

If human life want to survive on earth it purely depends on Agricultural. Because Agricultural sector is responsible for providing food and economic growth. Apples are popular because of antioxidants, vitamins, dietary fiber.2017 research review found that people who consume most fiber they are having lower risk of cardiovascular, coronary heary disease and heart strokes [1]. So we need to increase the apple cultivation. Grapes

also good source of potassium and no of vitamins and minerals. These are very good for the problems, cancer, constipation, diabetes and allergies [2].Cucumbers has high water content vegetable's it prevent from dehydration in hot weather and after workout also. Cucumbers also contain vitamin-k which helps in blood clotting. Cucumbers have anti-inflammatory benefits which helps from cancer, diabetes and cardiovascular diseases [3].But above fruits are susceptible to many different diseases caused either by excessive chemical use or by bacteria, viruses, and fungi. In order to minimize product losses, it is important for the agriculture industry to detect these diseases early The right diagnosis of plant diseases is critical, as incorrect treatment can increase resistance to pathogens that affect the plants. Manual diagnosis of leaf diseases delays diagnosis and treatment. So we need fallow the artificial ways to find out the leaf diseases in early stages to give the correct treatment for them.

Machine learning is used to identify the leaf diseases in early stages with better accuracy results. Machine learning approaches such as SVM, KNN, CNN algorithms are used to identify diseased leaf and healthy leaf.

Basic steps of machine learning algorithms.
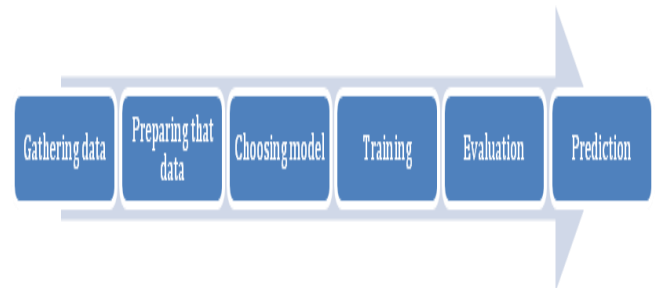
II. Literature Survey

Lot of work has been devoted to detect the leaf disease detection using image processing along with machine learning algorithms. But still it continues to get the better accuracy results with new classification algorithms.

Devanshi Salva, Vijaypal Singh presented comparative analysis of Resnet50,VGG-16 , Alex Net, Inception to classify apple scrab,rust,black rot but VGG-16 gives best accuracy of 92.50% with compare to other techniques[4]. Prakash bansal, rahul Kumar proposed deep convolution neural network combination of pretrained DenseNet121, EfficientNet B7 and Efficient Net Noisy Student is used to identify and classify healthy apple, cedar rust and multiple diseases with accuracy of 96.25% [5]. Nagaraju,swetha proposed VGG-16 is best model for classifying the apple and grapes with accuracy of 97.87%[6].Pang Wang team proposed

Convolution neural network with attention mechanism different apple disease such as healthy, mosaic, rust, glomerella leaf spot, Black rot, scrab, lithura moth and apple leaf mites with accuracy of 98.92% which much gives much accuracy rate compare to Resnet-152, Densenet-264, ResneXt 101[7].Cucumber is most important vegetable used in salads as well as best for health to prevent from dehydration problems but it effects from some diseases such Angular leaf spot,Anthrocone ,blight, downy mildew, powdery mildew. These are decrease quality and quantity of cucumber crops. So Mohammad athiq khan and his team members proposed multi level Deep entropy-ELM feature selection to recognize the diseased leaf in early stages for better quality and quantity of cucumbers[8].Early detection of diseases is most beneficial for farmers to gain healthy products and better economic rate.To identify diseased cucumber leafs by local Tri Directional patterns is used to select features from images and classification is performed using Quadratic support vector machine with accuracy of 96.80%[9]. Xiangyu Lu , Rui Yang proposed Ghost convolution model for grape leaf disease detection with accuracy 98.14% with only 1/3 of memory utilization compared with modelnetV3[10].Murat Koklu, IIkar ali ozkan proposed model called CNN based SVM model.In this features are extracted from MobileNetv2 and after extracting features classification is performed using Support Vector Machine with accuracy of 97.60%[11]. Grape black measles disease most destructive of all plant diseases, which useverily reduces quality and quantity of products. This paper said that Fuzzy based approach such as DeepLabV3+ is used to detect the severity of black measles in early stages with accuracy of 97.75%[12].From this paper we know that Diagnosis of grape leaf diseases using automatic K-means clustering and machine learning[13]. Yipping Chen suggested new model is a combination of firstly location of leaf lesion for data augmentation using Faster R-CNN and identification of lesions are using Res Net finally identification is performed by generative adversarial network to provide effective leaf disease detection[14]. M. Shantkumari & S. V. Uma proposed new model called convolution neural network along with improvised K-Nearest Neighbor model for extraction of high quality gradient features to detection of leaf images.[15]. Grape Net is provide best classification algorithm compared with remaining classification models to

detect the leaf diseased images is proposed by Jian wu.[16].Xian Yin,Wenhua Lie, Zhen Li,Lili Yi proposed new model called Grape leaf disease identification using Deep Transfer Learning named as GrapeNetV3 (GLD-DTL).They one improvement to the existing convolution network is last convolution layer is replaced by batch normalization function. Because it provides fewer parameters, fast recognition and training speed also [17].

III. Overall Performance of Classification Algorithms for Apple, Grape and Cucumber Leaf Disease Detection

First Author, Year	Name of Classification Algorithms	Classification of Diseases	Reported Accuracy	Advantages	Disadvantages	Future Research Direction
Devanshi Savla,2022	VGG-16	Apple Scrab,rust,black rust.	92.50%	Improve Vanishing Gradient Problem Accuracy,Speed		To remove Vaanishing Gradient Problem using Resnet.And also perform classification more apple leaf diseases.
Praksh Bansal, 2021	Ensemble of pretrained architectures such as DenseNet121,EfficientNet B7,Efficient Net Noisy Student	Apple scrab,apple cedar rust,healthy leaves	96.25%	DenseNet-Alleviate vanishing gradient problem Efficient net-Higher accuracy, better efficiency	DenseNet-Data is replicated many times Efficient Net-less computational capability.	To remove replicated data with best architectures,To improve computation capability with better architecture.
Nagaraj	Fine tuned	Apple:Scrab,ceda	97.87%	Training	Take	Need to

u Y,2020	VGG_16	r rust,healthy,Black rot Grape:Black measles,Black rot,leaf blight,Healthy leaves		time reduced by transfer learning	more time and computational power	classify more diseases in Apples and Grapes.
Peng Wang,2021	Coordination Attention EfficientNet(CA-EfficientNet)	Glomerella leaf spot,Black rot,Apple litura moth,rust	98.92%	Fast running speed,Good generalization performance.	Reduce number of parameters	In Future mobile equipped with cameras for early warning of apple diseases
Muhammad Athiq Khan,2022	Entropy ELM technique	Cucumber:Downy Mildew,powdery mildew,blight,Cucumber mosaic,Angular leaf spot,Anthracnose	98.4%	Accuracy is improved	Computational time is increased	Efficient Deep model is used to improve computational time with Butterfly meta heuristic algorithm
Cucumber leaf disease detection	Quadratic Support Vector Machine(Q-SVM)	Healthy,Antharcnose,Aphids	96.80%	Robust to noise	Long Training time	Need to classify more cucumber diseases
Xiangyu Lu,2022	Ghost enlightened Transformer model	Cucumber:Downy Mildew,powdery mildew,blight,Cucumber mosaic,Angular leaf spot,Anthracnose,Esca	98.14%	Model lighter and more effiecient	Need lager dataset	In Future Lesion area segmentation is used to diagnose and severity of diseases at the same time

Murat koklu,2022	SVM	powdery mildew,blight, Downy Mildew, ,Cucumber mosaic,Angular leaf spot.	97.60%	Most suitable high dimensio nal separatio ns	Not suitable for large dataset	In future need to take large dataset for more diseases classifica tion
Automatic detection of severity of grape black measles ,2022	Deep lab v3 model based Fuzzy system	Grape:Black measles categorized based healthy,mild,med ium and severe.	97.75%	Better perfoman ce	Difficult to Use different techniqu e for noise removin g from images	In future use best image noise removal technique s for better performa nce
Syed Moham mad Javidan, 2022	Novel Image processing system,Support vector machine	Cucumber:Black measles,black rot and leaf blight	98.71%	More effective in high dimensio nal spaces,m emory efficient	Not suitable for large datasets	In future we need use new architectu re that support large dataset
Yiping Chan,2022	Faster R-CNN,DCGAN and resnet	Detection of lesion grape leaf images	Better accurac y	Redunda nt and blur informati on is removed	Time taking process	Need to improve Processin g time
M.Shan tha kumari, 2022	K- Nearest Neighbor (IKNN) model	Early detection of grape leaf diseases and distinguish between different classes	Better accurac y	robust	Take lot of memory	Need to reduce memory utilizatio n
Jianwu lu,2022	GrapeNet	Identification of Different stages of grape leaf symptoms	Highest accurac y compar e to DenseN et121	Take more number of parameter s	Backgro und of images will effect the accuracy of model	In future need to develop model to grape leaf disease recogniti on under field condition

						s.
Xiang Yin,2022	MobileNetV3	Recognition of black rot,Esca measles,downy mildew,leaf spot,phyllexora	99.84%	Size of model is 30MB	-----	In future need to develop a model to classify more grape leaf diseases

IV. Squeeze Net

Squeeze Net contains stacks of fire modules and few pooling layers. SqueezeNet is convolution neural network with 18 layers deep. It has three advantages.

1. Smaller convolution network requires less communication across servers.

2. It requires less bandwidth

3. More feasible to deploy on FPGA and other hardware with limited memory.

Squeeze Net architectures:

i) Replace 3*3 filters with 1*1 filters

ii) Decrease number of input channels

iii) Large activation function with higher classification accuracy

V. Conclusion

Quality of apple, grape fruits and Cucumber are directly impacted by diseases. It is time consuming, expensive, and requires human intervention to control these diseases using classical methods. DCNN models have shown promising development in the early detection of diseases. By using transfer learning, DCNN model training time can be significantly reduce. Existing Convolution Neural Networks such as Alex Net, VGG-16, and ResNet50 is modeled for automatic feature extraction and classification of diseased leaf images. Above methods are some drawbacks such as take large input image 224*224 pixel size, It is very slow to train and so it takes quite a lot of disk space & bandwidth which makes it inefficient It does not do as well with color images. And takes more time to achieve higher accuracy, deeper network usually requires weeks for training, making it practically infeasible in real-world applications. The proposed model, Squeeze Net, aims to optimize classification accuracy while keeping the model small (low computational complexity and few parameters).Image Noise is removed by using different filters such as Gaussian filter, bilateral filter and Universal Noise removal filter. Extracting Texture features using Gray level Co

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occurrence matrix. Classification is performed using Squeeze Net with better accuracy and requires less memory utilization.

VI. Future Scope

In Proposed model Squeeze Net suffer from two disadvantages such as accuracy is very low and complexity is also high and also structural parameters are very small, it is not conducive to deployment on mobile devices. So in future we need to eliminate these problems with better architecture called Octave convolution pools Squeeze Net (OctSqueezeNet))for increasing classification accuracy and computational amount as well as need to deploy on to mobile devices because now a day's everybody familiar with mobile devices.

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