ZKG INTERNATIONAL ISSN: 2366-1313

Deep Learning-Based CNN model for Cotton Leaf Disease Detection

[1] **Maddila Pavan Kumar,** [2] **M. Rama Bhadra Rao,**

[1] MCA Student, Dept. Of MCA, Swarnandhra College of Engineering and Technology, Seetharampuram, Narsapur, Andhra Pradesh 534280,

maddilapavankumar09@gmail.com

[2,] Assistant Professor, Dept. Of MCA, Swarnandhra College of Engineering and Technology, Seetharampuram, Narsapur, Andhra Pradesh 534280,

***Abstract**: Deep learning is part of synthetic intelligence. This is a form of artificial intelligence and machine mastering that tries to simulate how humans store particular information. The goal of this mission is to increase a deep getting to know version primarily based on neural networks capable of distinguishing healthful leaves from diseased leaves. Due to its useful features for self-learning and function extraction, it has attracted lots interest in latest years from researchers and business specialists. Photos of healthful and rotten leaves are included within the document. It is widely used in industries which include computing, audio, pics and video. It has additionally become a centre for the study of agricultural plant protection, together with plant disorder research and pest evaluation. This take a look at additionally addressed a number of the problems we're presently facing that want to be addressed. Library programs along with KERAS, MATPLOTLIB, NUMPY and OPENCV are used here.*

KEY WORDS- Dead leaves, Artificial Intelligence, Colour Analysis in images, Feature Extraction, Deep Learning

I. INTRODUCTION

If plant diseases are spread around in the wild, they can not only impede the capacity of humanity to create foods, but they also affect the economy of small-holder farmers. The estimates that crop losses are greater than 50% due to insects and diseases are not uncommon in the world, and more than 80% of all agriculture-related land production in the world's growing economy is produced by smallholder farmers. The majority of the hungry population in the world is farmers on a small scale, which makes them particularly susceptible to

ISSN: 2366-1313

illnesses. A lot of packages are advanced. The past decade, methods for controlling pests have mostly substituted pesticides for insect control. However, the early diagnosis and a correct prediction of the disease are crucial to ensure a successful hit control. Local clinics for agriculture and extension services have contributed to sickness detection. In recent times online, on-line tools for analysis has assisted the process by in conjunction with the growth of Internet utilization around the world. With the use of a previously undiscovered mobile technology, numerous of smart phones have appeared over the last few time. The visual detection of plant diseases can be exhausting, difficult and not applicable outside of certain conditions.

II LITERATURE REVIEW

Jagadeesh D. Pujari, Abdulrnunaf S. Byadgi, Rajesh Yakkundirnath," Identification and class of fungal ailment affected on agriculture/horticulture plants the use of photo processing strategies" International Conference on Computational Intelligence and Computing Research, pp. L- four, 18 December 2014

Jagadeesh J. Pujari is an academic, researcher or a specialist in one particular area you can find additional details on him by the databases for educational institutions, websites, and professional networking systems such as LinkedIn. Researchers often are on LinkedIn profiles that they can share details regarding their education history their research interests and guidelines.

Be aware that some people who have records of private individuals, or those that are not currently visible to the general public might not be readily accessible online. If you've earned access to the school or institute that has a connection to Jagadeesh and D. Pujari, then you might find additional information through these channels.

MingjieLv Guoxiong Zhou; Ming fang He; Aibin Chen; Wenzhuo Zhang," cotton Leaf Disease identification based on feature enhancement and DMS-Robust Alex internet" 8. 57952-57966, 23 March 2020. MingjieLv; Guoxiong Zhou; Mingfang He; Aibin Chen; Wenzhuo Zhang," cotton Leaf Disease Identification Based on

Feature Enhancement and DMS-Robust Alex net", volume8,pp-5795257966,23 March2020.

The recognition of diseases affecting maize leaves is a daunting task because of the difficulties in determining Lesion-related functions from the constant-converting environs, the choppy illumination mirror images of the light source, as well as many other aspects. In this article we propose a novel Maize leaf disorder popularization technique is presented. This method created a maize-based character enhancement framework that has potential to enhance the performance of maize in the complex conditions. After that, a new neural network is developed that is based entirely on backbone Alex net structure. The network is called DMS-Robust Alex net. The DMS-Robust Alex net uses convolutions that are dilated as well as multi-scale is combined to increase the efficiency of the function extraction.

Normalization in batch is implemented to avoid the network from over-fitting while also increasing the quality of the software. Peru's activation function as well as the Ad abound optimizers are employed to boost each convergence as well as the accuracy. Through experiments, it has been verified from specific perspectives to show that the maize leaf disease function enhancement algorithm can contribute for enhancing the performance of DMS-Robust Alex net detection. The method we have developed is robust and durable in the collection of maize disease photos from the surrounding herbal environment and provides a basis to a shrewd diagnosis of different leaf diseases of plants.

Veni, G.M. Aishwarya mala, P.M. Vishnu Priya, K.Ashwini R. Anusha

When "Veni" or "G.M. Aishwarya Mala" has been both researchers, examining their work in the Journal of Theoretical and Applied Information Technology as well as other pertinent programs to which they've contributed could provide more information about their work and knowledge. If you have gained right for access to educational databases, look up their classes the use of their names to find more details on their contributions to research.

Saraswat, Endang, Rika Sustika, R.Sandra Yuwana, Agus Subekti, and Hilrnan" the detection of leaf diseases using Deep Convolution Neural Network", pp.385-319, 2018.

Infections caused by plant pathogens could pose significant risk for food protection. It is important to detect the disease early and by using systems learning is a must to protect from such a catastrophe. In the present, deep mastering that is the most recent technology in machine learning, has gained a lot of attention for its task recognition of objects. Convolution neural networks (CNN) are among the most important method for identifying objects in deep learning. This paper will analyze the effect of various levels of CNN structures on the accuracy of plant diseases detect. Different CNN structures with distinct depths are examined. They include CNN base (with layers of convolution layers), Alex Net (with five convolution layers) as well as VGG Net (with 13 Convolution Layers). We also analyze Google Net designs. Contrary to the previously mentioned architectures, Google Net use convolution layers that have different resolutions. They are coupled with all the different

Saban, Adhikari, Shrestha, Santosh, Baiju, Bibek; K.C., If they are lecturers, researchers or experts in a specific area, you will be able to find further information on them by looking through educational databases, institutions websites, and expert networks like LinkedIn. Researchers frequently have profiles on those websites where they share information regarding their education or research activities, as well as guidelines.

If you've gained access to educational databases you can also look for the original work or other related documents written using the help of these people to gain more insight on their contributions to research.

III System Analysis

EXISTING SYSTEM:

Traditional methods of visualization Prior to deep learning, traditional techniques of visualization were used. It could be using manual created techniques, segmentation strategies or completely systems based on rules. Manual extraction: On the current device it is possible that diagnostic information have been manually extracted. The features can include the texture, colour and shape data Rule-based fully classification algorithms: The current device may also use classes based on rules or understanding of the device's learning algorithms, that include aid Vector Machines (SVM) and random forests.

ISSN: 2366-1313

Limited expansion: The traditional methods may be limited in adapting to various statistical sets and adapting to changes in leaf snaps or sick patterns.

DISADVANTAGES OF EXISTING SYSTEM:

Data extraction manual: The traditional techniques usually rely on guides for information extraction. It requires a lot of effort and does not collect all pertinent statistics. The result is an erosion of the robustness and scaling.

Artifacts and dependence: The efficiency of traditional systems depends a lot upon the selection and type of artifacts. If the capabilities selected don't accurately reflect what is happening in the body, then the accuracy of the system may be hampered.

Insufficient generalization:

Conventional techniques can also be unable to generalize correctly to distinct sets of data or scenarios. The absence of a model could be one of the main dangers when thinking about different perspectives in lighting, setting or the type of illness.

Sensitivity to variations in the photograph: Traditional structures may be adapted to different photo conditions, as well as variations in the lighting fixtures, their orientation of a photo or even the decision. It can also impact the diagnostic sensitivity.

The difficulty of dealing with complicated patterns: Conventional methods may confront difficult situations while handling intricate patterns, as well as the diffused version on leaf images that have been correctly captured by means of in-depth learning methods.

High fake high-quality/negative charge: Due to their reliance on guidelines and artifacts, conventional structures will have excessive fake wonderful or false bad prices, main to no detection results. Specific ailment.

Problems with scaling: The traditional methods can be incompatible with scaling efficiently when dealing with huge databases or looking at images in real-time.

Limitations in automation: Conventional machines are often not equipped with the automated capabilities that deep learning models, including convolution neural networks. Automation is essential to handle the increasing amount of data that is generated by agriculture

PROPOSED SYSTEM:

Convolution Neural Networks (CNN): The proposed device introduces the

ISSN: 2366-1313

use of CNNs, a kind of deep studying structure that has proven amazing fulfillment in image-associated tasks. End-to-End Learning: CNNs permit cease-to-give up mastering, mechanically getting to know hierarchical capabilities from uncooked information, disposing of the want for manual feature extraction. Transfer Learning: The proposed gadget would possibly leverage pre-trained CNN models on big datasets (switch gaining knowledge of), allowing for higher overall performance inspire of restrained categorized facts for the specific undertaking.

Increased Accuracy: The proposed system goals to improve accuracy and robustness in sickness detection, making it greater effective in identifying various varieties of sicknesses affecting cotton leaves. Automation and Scalability: CNNs permit automation, making the gadget more scalable to handle large datasets and adaptable to exceptional eventualities without sizeable manual intervention. Integration of Sensor Data: The proposed machine can also comprise facts from various sensors, such as thermal or hyper spectral imaging, to enhance disease detection abilities.

Benefits of proposed system:

* **Automated Feature-Learning:** CNNs can routinely analyze hierarchical operations from data and eliminate the need of manual feature extraction. This allows the system to adjust to the various patterns and differences of the information input.

End-to-End learning: The gadget allows for quit-to-give away knowing, which implies that the entire device, from input to output, is immediately discovered through the information. These aids in taking photos of intricate relationships between enter capabilities as well as sickness patterns.

Increased Accuracy: CNNs have demonstrated superior general performance for image-related responsibilities as well as sickness detection. This device could be able to achieve greater precision, sensitivity and specificity when it comes to identifying various types of illnesses that affect cotton leaves.

Ability to Transfer Learn: The use of already-trained CNN patterns on large databases allows transfer learning. This is extremely beneficial for managing data with limited labels

ISSN: 2366-1313

specifically for the detection of disorder in cotton leaves.

Ability to Adapt: CNNs are recognized for their ability to adapt to different types of data and scenarios. This system is developed to identify patterns across different sets of snaps and thus making it more reliable and adaptable.

Reducing the dependence of Handcrafted Features: By robotically analyzing functions, the machine reduces the dependence on hand-crafted features rendering the system less prone to the choice of features as well as boosting regular robustness.

Ability to Scale: CNNs can correctly take the care of large datasets, and can scale up to cope growing volumes of data. This is vital for agriculture, where the monitoring of huge fields and plant population isn't uncommon.

IV EXPLORATORY DATA ANALYSIS

```
from tensorflow.compat.v1 import ConfigProto
from tensorflow.compat.v1 import InteractiveSession

config = ConfigProto()
config.gpu_options.per_process_gpu_memory_fraction = 0.5
config.gpu_options.allow_growth = True
session = InteractiveSession(config=config)
```

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.models import Model,Sequential
from keras.layers import Dense,Dropout,Activation,Flatten,BatchNormalization
from keras.layers import Conv2D,MaxPooling2D
```

```
train_data_dir='//content/drive/MyDrive/Colab Notebooks/data/train'
test_data_dir='/content/drive/MyDrive/Colab Notebooks/data/val'
```

```
training_set = train_datagen.flow_from_directory(train_data_dir,
                                                 target_size = (224, 224),
                                                 batch_size = 16,
                                                 class_mode = 'categorical')
```

```
Found 1951 images belonging to 4 classes.
```

```
from keras.preprocessing.image import load_img,img_to_array
```

Diseased Image

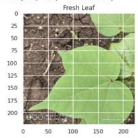
```
image_path='/content/drive/My Drive/Colab Notebooks/Cotton Disease Pridiction/train/diseased cotton leaf/dis_leaf (1)_iaip.jpg'
new_img = load_img(image_path, target_size=(224, 224))
plt.figure(figsize = (4,4))
plt.imshow(new_img)
plt.axis('off')
plt.title("Diseased Image")
```

```
Text(0.5, 1.0, 'Diseased Image')
```

Fresh Leaf

```
fresh_img='/content/drive/My Drive/Colab Notebooks/Cotton Disease Pridiction/train/fresh cotton leaf/d (10)_iaip.jpg'
new_img=load_img(fresh_img,target_size=(224,224))
plt.figure(figsize=(4,4))
plt.imshow(new_img)
plt.title("Fresh Leaf")
```

```
Text(0.5, 1.0, 'Fresh Leaf')
```




```
model=Sequential()
```

```
model.add(Conv2D(32,(3,3),activation='relu',input_shape=(224,224,3)))
model.add(MaxPooling2D(2,2))
model.add(Conv2D(64,(3,3),activation='relu'))
model.add(MaxPooling2D(2,2))
model.add(Conv2D(64,(3,3),activation='relu'))
```

```
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
Layer (type)                Output Shape              Param #
=================================================================
conv2d (Conv2D)             (None, 222, 222, 32)      896
_________________________________________________________________
max_pooling2d (MaxPooling2D) (None, 111, 111, 32)     0
_________________________________________________________________
conv2d_1 (Conv2D)           (None, 109, 109, 64)      18496
_________________________________________________________________
max_pooling2d_1 (MaxPooling2 (None, 54, 54, 64)       0
_________________________________________________________________
conv2d_2 (Conv2D)           (None, 52, 52, 64)        36928
=================================================================
Total params: 56,320
Trainable params: 56,320
Non-trainable params: 0
_________________________________________________________________
```

```
from keras import layers
```

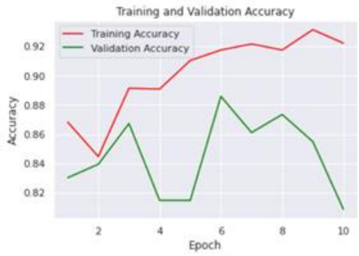
Accuracy plot

```
#accuracy plot
plt.plot(epochs, acc, color='red', label='Training Accuracy')
plt.plot(epochs, val_acc, color='green', label='Validation Accuracy')
plt.title('Training and Validation Accuracy')
plt.ylabel('Accuracy')
plt.xlabel('Epoch')
plt.legend()

plt.figure()
#loss plot
plt.plot(epochs, loss, color='pink', label='Training Loss')
plt.plot(epochs, val_loss, color='blue', label='Validation Loss')
plt.title('Training and Validation Loss')
plt.xlabel('Epoch')
plt.ylabel('Loss')
plt.legend()

plt.show()
```

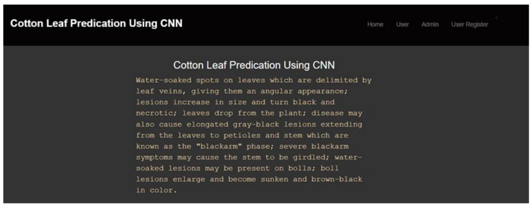
ISSN: 2366-1313

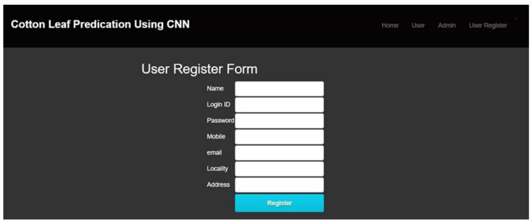


Data Set Description

The next step is to use the test picture to and then perform any necessary processing and then transform the photo into an array layout to be evaluated. When the database has been selected then it's first constructed, divided and renamed before being put into its directories. CNN can improve the quality of information once having properly trained the version. When the table and solid evidence are in sync, the results can be displayed. The program will show the symptoms and remedies when the plant is infected. The software is available via on the Co Lab server. This variable is able to examine every picture in that direction. Every image is decoded by using an application called the Open CV library.

V Design





User Path:

Login: The procedure begins by establishing user credentials, and user logs in to the device using password.

Download Image: Upon logging in, the person snaps pictures of the inflamed leaves of cotton.

Processing: Photos uploaded are processed through preprocessing, which consists of normalization, resizing and expansion in order to get them ready for examination.

The photos are processed to predict disease. Can be fed directly into a device that gains understanding of the model. This determines the species(s) which affects the cotton leaves.

Displaying results this device displays its prediction results for the user, showing the identified infection(s) as well as other relevant information.

The Leader's Path

View User: Administrators has the ability to access records about registered users. These records include the usernames, roles and statistics on service usage.

Upload Dataset: Like the user's path, the administrator may upload datasets with photos of inflamed cotton leaves, either for modeling training or for validation purposes.

Control clients: The administrator is given the power to handle consumer debts and also disallowing or denying payment in the manner desired.

Highlights:

Shapes: Circles are used to represent strategies or moves (e.g. Login, picture upload) and simultaneously, rectangles symbolize roles or aspects (e.g. View of the administrator).

The relationship strains are indicated by the Arrows. They indicate that the move with the technique, linking every stage of the collection of family members and the presentation of results.

Data transformation: Preprocessing procedures are described to show how to transform raw data (uploaded photos) into the format that is suitable for analysis by a gadget mastering version.

User Interaction: The diagram focuses on the components of interaction with consumers that include entering and outlining results, which emphasizes the design of systems that are targeted to individuals.

Administrative duties: Specific administrative tasks, in addition to the control of records and consumers are covered in order to illustrate the capabilities of administrative and managerial within the framework.

The data float diagram offers an image of the process flow for the system illustrating how the users interact with the computer to create photos, receive predictions as well as how admits supervise users' activities as well as managing the system's assets.

VI MACHINE LEARNING ALGORITHMS

The process of achieving high precision in the prediction of ailment

ISSN: 2366-1313

in cotton leaves using deep mastering is a matter of using a range of methods and strategies to enhance the efficiency that the algorithm achieves. Below are a few methods that are commonly used to improve the accuracy of your model:

Data Augmentation: Enhancing the data set used for training with methods like flipping, rotating or scaling will increase the number of leaf photos, allowing the model to test strong capacities and patterns.

Transfer Learning: Utilizing already trained models that are educated on large image datasets that include Image Net as well as first-class-tuning them in order to achieve specific purposes of prediction of diseases affecting cotton leaves could greatly increase accuracy particularly if the dataset is restricted.

Ensemble Learning: combining forecasts from multiple styles can result in greater performances. Techniques such as bagging or boosts can be utilized to build an assortment of styles that together can make better forecasts.

Model Architectures: Experimenting various deep learning models that include Convolution Neural Networks (CNNs), Recurrent Neural Networks (RNNs) as well as their variants (e.g., Res Net, Inception, Dense Net) can aid in identifying the high-quality structure that meets the need for Cotton leaf sickness predictions.

The tuning of the hyper parameters with the study fee batches, size of batch dropout fee, community depth could significantly impact the speed of the application. Strategies like grid search or random seek are a great way to determine the most effective collection of hyper parameters.

Regularization: Using regularization techniques that incorporate regularization of L1 and L2 as well as the dropout process, as well as normalization in batches can help to with avoiding over fitting as well as improving capacity to generalize the model. It will also ensure it is able to play well with unobserved figures.

Fine-tuning: Fine tuning the model through training just the upper layers in tandem with freezing lower layers

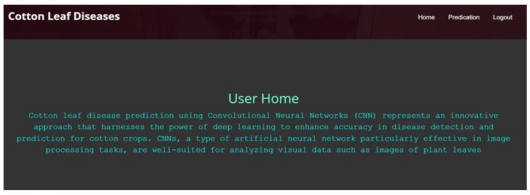
ISSN: 2366-1313

(particularly when switching to familiar situations) will help adapt existing functions to suit the specific task of cotton leaf diseases prediction.

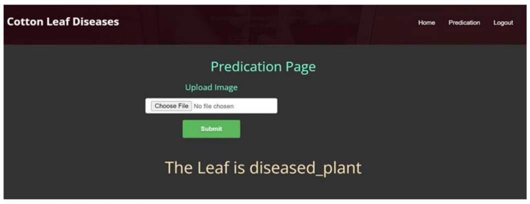
Class Imbalance Management: If the data has a high large classification imbalance (i.e. the distribution is not equal of the samples among diverse disorder categories) Strategies such as oversampling or under sampling or changing the weight of classes can be employed to tackle the issue and avoid from bias towards dominating courses.

Advanced Architectures: Exploring new designs that incorporate the attention mechanism such as pill networks, attention mechanisms, and graph neural networks that are tailored specifically to the nature of the cotton leaf disease predictions can lead to similar improvements in precision.

When you carefully select and combine these strategies, it's possible to create profound understanding of the techniques with high accuracy cotton leaf ailments predictions. The process of experimentation and refinement is usually necessary to make sense of the most effective aggregate of methods for any given database and the trouble domain.



USER HOME PAGE



PREDICATION PAGE

VII CONCLUSION

The learning bundle can be conducted using Internet of Things like Arduino as well as Raspberry Pi, included with drones, and placed within the vicinity; the CNN version was superior to the ANN version with respect to precision.

The purpose of this take an examination is to create an effective cotton leaf disease detect device. Cotton leaves form the primary vectors of disorder. If you don't remember how the sheet changes color or perceives it, human eyes aren't able to tell the difference. So, different methods are required to identify trees.

REFERENCES

[4 1. Anand Raju" An application of image processing techniques for Detection of Diseases on cotton Leaves Using K-Means Clustering Method", Fifth International Conference on Recent Trends in Information Technology, pp. 1-6, 2016.

[5 2.MingjieLv; Guoxiong Zhou; Ming fang He; Aibin Chen; Wenzhuo Zhang," cotton Leaf Disease Identification Based on Feature Enhancement and DMS-Robust Alex net", volume 8, pp-57952 57966, 23 March 2020.

3. Veni, G.M. Aishwarya mala, P.M. Vishnu Priya, K. Ashwini R. Anusha "Computer system for classification and detection of cotton leaf diseases by thermal and visible light images", Journal of Theoretical and applied information technology pp.5224-5236, 2017

4. Galip and Fatih. "Data Classification with Deep Learning using Tensor Flow." International Conference on Computer Science and Engineering (UBMK), pp.755-758, 2017.

5. Saraswat, Endang, Rika Sustika, R.Sandra Yuwana, Agus Subekti, and Hilrnan" Disease's detection for leaf Diseases by Deep Convolution Neural Network", pp.385-319, 2018.

6. Saban, Adhikari, Shrestha, Santosh, Baiju, Bibek; K.C., "plant diseases detection system using image processing". KEC Conference on Engineering and Technology, pp.81-86, 2018

7. K.P., Ferentinos, "Deep learning models for plant disease diagnosis and detection." Computers and Electronics in Agriculture, pp.312-319, 2018.

8. Robert DeLuna, Ehner Dadios, "Automatic image capturing system based on deep learning for leaf disease detection and recognition". Tencon IEEE Region 10 Conference, October 2018.

9. Jinzhou, Reza Ehsani, YeyinShi, Amassable de, Wang: Identification of multi-cotton leaf diseases in different stages by utilizing spectral-based sensor, pp. 1-11, Dec 1, 2018.

10. Prasadu Peddi (2018), "A STUDY FOR BIG DATA USING DISSEMINATED FUZZY DECISION TREES", ISSN: 2366- 1313, Vol 3, issue 2, pp:46-57.