KJEI INSTITUTE

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

PLANT DISEASE DETECTION USING DL

Presented by:
Namrata Jadhav
Sakshi Jadhav
Ekta Tondare

Under the guidance of :
Dr S.M. Handore

SPONSORED PROJECT

PIYUSH IT SERVICES, PUNE

Under the guidance of industry person we have selected the project topic Plant Disease Detection Using DL to advance the farming by detecting the disease present in plants. Classifies leaves with the help of image processing techniques by gathering some of the leaves and training them.

CONTENTS

ABTRACT

Agriculture is the backbone of the Indian government. Every human being requires a lot of production of crops to fulfill the needs of the Indian government. There are various types of diseases on plant leaves that cause problems in the development of crops. Because of these diseases, a large amount of crop production is being decreased. Human eyes can't identify the type of disease on plant. The automatic identification system is recommended in this algorithm to recognize automatically and relate the diseased part of the leaf images and it classifies leaves with the help of image processing techniques. At the starting stage, the disease can be easily a framework utilizing deep learning to detect and prevent plant disease from spreading. In pharmaceutical research, the recognition of leaf ailment is essential and thus it is necessary to detect symptoms of disease by image processing using an algorithm. The term disease refers to the type of plant damage. A CNN model for detecting the disease in tomato leaf by applying suitable deep learning-based image processing techniques to the images. Further deploying the model on the hardware that makes it easily accessible to all the farmers.

PROBLEM STATEMENT

Traditional manual methods for identifying plant diseases in agriculture are time-consuming and prone to errors. The adoption of deep learning for automated disease detection offers promise, but it faces several challenges

Our project aims to address these challenges by developing robust, adaptable, interpretable, and ethically sound deep learning solutions for plant disease detection, ultimately contributing to improved agricultural practices and global food security.

PROJECT OBJECTIVE

The primary objective of the project is to develop a plant disease detection system using Convolutional Neural Networks (CNN) or Deep Learning (DL) with a focus on providing a practical and accessible tool for farmers.

INTRODUCTION

- Modern technology is giving farmers methods of producing more food, however food production is still quite low. The Food and Agriculture Organization (FAO) of the United Nations (UN) estimates a raise in global population to about 9.6 billion people by 2050 with need to match that figure in food production to increase by 70 percent by 2050.

- Food production is being reinforced with smart computing technology from environment control, disease detection, to disease prediction. Deep learning techniques are championing the trend of smart farming.

- Plant leaves are very vital parts of a plant, being the major channel for photosynthesis which is a major source of nutrition and growth for plants. This research is directed towards detecting tomato diseases.

LITERATURE SURVEY

Sr.No	Name Of Inventor	Product Description	Accuracy
1.	Er. Saban Kumar K.C.	Plant Disease Detection Using image processing	89%
2.	Wakeel Ahmad	disease detection in plum using CNN	65%-75%
3.	V. Anantha Natarajan	in his research used DL technique specifically faster R-CNN with deep feature extractor as ResNet50 to classify and detect tomato disease.	80%
4.	Abhishek Singh	.devised a Convolutional Neural Network (CNN) to detect and classify diseases	91%

Tomato Leaf Diseases

These diseases of leaves destroys the surface of tomato leaves by creating lesions which reduces the photosynthetic area for light penetration which in turn reduces yield. The model generated from this research can also detect healthy tomato leaves.

Tomato leaf diseases can be caused by various factors such as bacteria, fungi, viruses, and environmental stress. Some disease cause spots on the leaves that can grow into larger lesions, Some can cause a rapid collapse of the plant. Also some can cause small black spots on the leaves and also yellowing and curling of the leaves.

DATASET :

- These are the images which are used to train and test our CNN model, we will use the Tomato Leaf Disease dataset, which will consists of 10,000 tomato leaf images, captured under different lighting conditions and angles.

- The dataset contains images of healthy tomato leaves as well as leaves affected by nine different diseases.

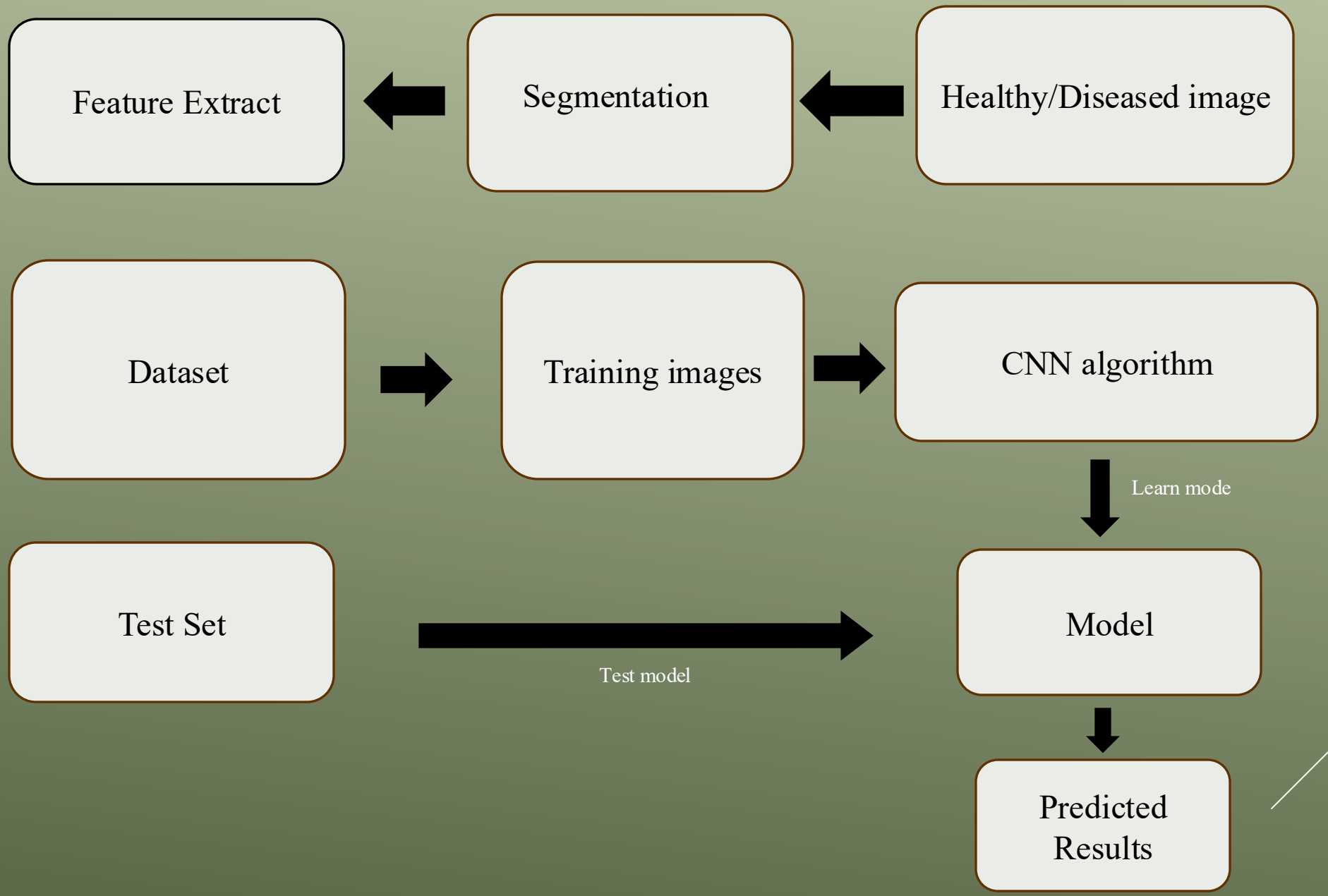
- There will be 10000 images in training dataset, 7000 images in validation dataset and 500 images in testing dataset. Out of 10000 training images, 1000 images belong to healthy category and 1000 images belong to each tomato disease category described below. In validation set each class has 700 images and test set has 50 images in each class. But till we gathered just 30 images of each disease including healthy images.

DISEASES PRESENT IN TOMATO LEAVES

There are mainly nine types of diseases in tomato:

1) Target Spot
2) Mosaic virus
3) Bacterial spot
4) Late blight
5) Leaf Mold
6) Yellow Leaf Curl Virus
7) Spider mites: Two-spotted spider mite
8) Early blight and
9) Septoria leaf spot.

Block diagram



Why to use Deep learning ?

1.End-to-End Learning: DL models like CNNs learn tasks without manual feature design, in contrast to traditional ML requiring explicit feature engineering.
2.**Performance on Image Data:** CNNs excel in image-related tasks like object detection, crucial in plant disease detection due to their proficiency in recognizing spatial relationships and patterns.
3.Adaptability to Data Sizes: DL models, including CNNs, adjust to varying input sizes, making them suitable for tasks with diverse image resolutions or aspect ratios.
4.Hierarchical Feature Learning: CNNs automatically grasp features from raw data, with lower layers capturing basics (edges) and higher layers handling complexities (shapes).

Training process involves –
Data Augmentation

- **Preprocessing**

  Resizing and Normalizing: The various CNN network (classification experiments) has input image siz requirements. Thus, the images were resized to 227 × 227. Similarly, the images were resized to 224 × 224 for the CNN model.

- **Augmentation:**

  Since the dataset is not balanced and the dataset does not have a similar number of images for the different categories, training with an imbalanced dataset can produce a biased model. Thus, data augmentation can help in having a similar number of images in the various classes.
  In these three augmentation strategies (scaling, shear range, zoom range, horizontal and vertical, and validation) were utilized to balance the training images.

CONVOLUTION NEURAL NETWORK

- Deep Convolutional Neural Network is utilized in this study to identify infected and healthy leaves, as well as to detect illness in afflicted plants. The CNN model is designed to suit both healthy and sick leaves, photos are used to train the model, and the output is determined by the input leaf.

- CNNs are a type of deep neural network that is specifically designed for image classification tasks. CNNs consist of multiple layers, including
  -convolutional layers,
  -pooling layers,
  -fully connected layers.

- The convolutional layers apply filters to the input image to extract features such as edges, corners, and textures The pooling layers reduce the size of the feature maps while retaining the important features. The fully connected layers perform the classification task based on the extracted features.

CNN BLOCK DIAGRAM

Input Data

Convolution layer

Max pooling layer

Convolution layer

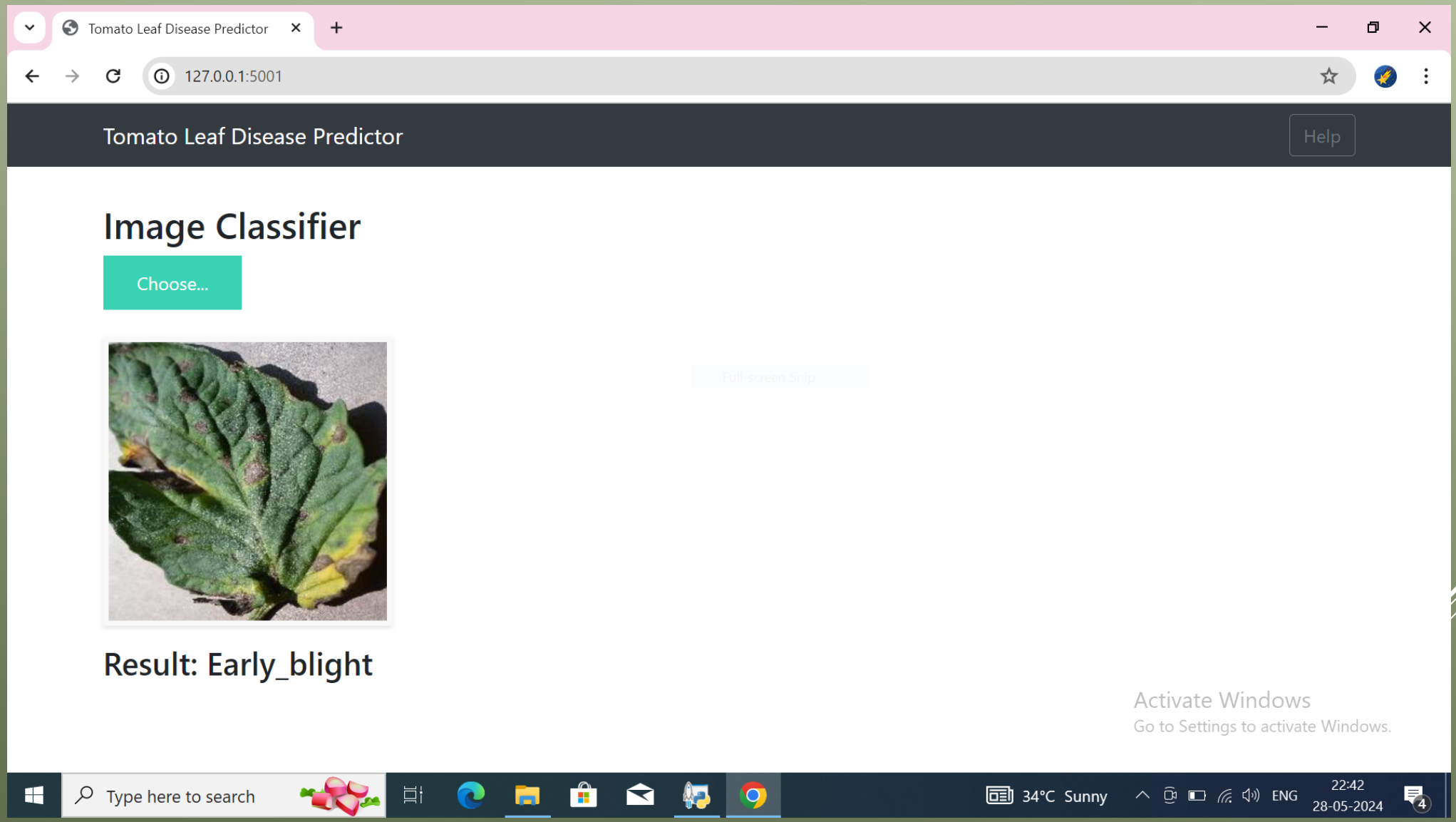
Max pooling layer

Feature Extraction

Fully connected layer

Classified Output

Result


Tomato Leaf Disease Predictor
127.0.0.1:5001
Tomato Leaf Disease Predictor
Help
Image Classifier
Choose...
Result: Early_blight
Activate Windows
Go to Settings to activate Windows.
Type here to search
34°C Sunny
ENG
22:42
28-05-2024

CONCLUSION

In conclusion, our project has demonstrated the potential of deep learning in revolutionizing plant disease detection in agriculture. The accuracy of the model is Train Accuracy: 98.25%
- Test Accuracy: 96.72%
- Precision Score: 96.72%
- Recall Score: 96.72%

By addressing key challenges such as data quality, model adaptability, interpretability, resource constraints, and ethical considerations, we have laid the groundwork for the development of reliable and scalable solutions that can significantly impact global food security. Moving forward, continued research and collaboration are essential to further refine and deploy these technologies effectively, empowering farmers and agricultural stakeholders to mitigate the impact of plant diseases and ensure sustainable crop production.

FUTURE SCOPE

1. Expanding on disease detection, we could develop a system suggesting remedies and farming techniques tailored to each specific disease detected.
2. To enhance accuracy, captured images could be stored in the model for future reference and analysis.
3. Implementing a chatbot feature would facilitate user-system interaction, enhancing accessibility to services.
4. To improve the model's accuracy, augmenting the dataset.
5. Additionally, integrating weather APIs can provide real-time weather verification for better farm management and decision-making.

REFERENCES

[1] Santosh Adhikari, Er. Saban Kumar K.C, Bikesh Shrestha, Bibek "Tomato Plant Disease Detection Using Image Processing" 1st KEC Conference Proceedings, September 27, 2018

[3] Jamil Ahmad, Bilal Jan, Haleem Farman, Wakeel Ahmad and Atta Ullah "Disease Detection in Plum Using Convolutional Neural Network under True Field Conditions" Sensors 2020-20(19)

[4] Dr. V. Anantha Natarajan, Ms. Macha Babitha, Dr. M. Sunil Kumar, "Detection of disease in tomato plant using Deep Learning Techniques," International Journal of Modern Agriculture, Volume 9, No.4, 2020

[6] Mohit Agarwal, Abhishek Singh, Siddhartha Arjaria, Amit Sinha, Suneet Gupta "Tomato Leaf Disease Detection Using Convolution Neural Network" Procedia Computer Science Volume 167, 2020

Research Paper

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 4, No. 7, April : 2024

PLANT DISEASE DETECTION USING DL

Tondare Ekta, Student of Engineering, E&TC Depart. Pune University.
Dr. Shubhangi M. Handore, Professor of E&TC Depart. Pune University.
Jadhav Sakshi, Student of Engineering, E&TC Depart. Pune University.
Jadhav Namrata, Student of Engineering, E&TC Depart. Pune University.
Rushikesh Tanksale, Industry person.

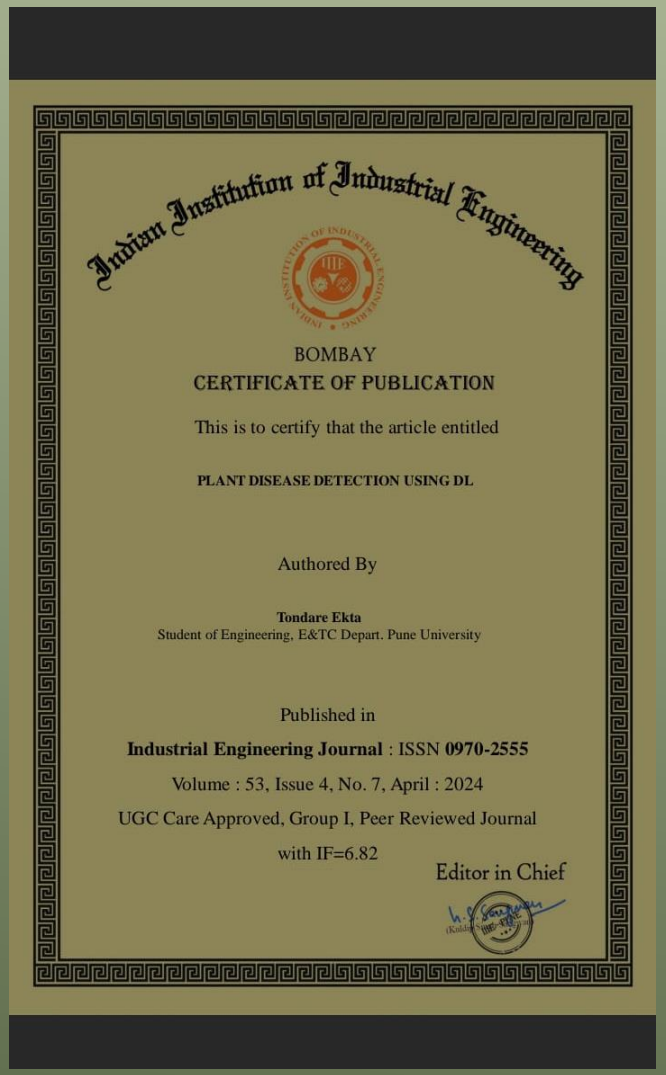
Abstract
Today's technology has brought revolution in many fields including Agriculture. It has a lot of potential to boost crop output and to deal with food security. Tomato being one of the most essential and widely consumed vegetables not only in India but globally, is prone to various diseases which cause severe yield loss. There are 9 different diseases which attack tomato leaves. And so, it demands a technology which will detect the disease and increase the production. In this paper we used DL, Image preprocessing and TensorFlow for detection of disease. The Dataset from Kaggle is used along with some manual data. However, CNN is used for image classification tasks which automatically learns hierarchical features from raw pixel data. Then to mitigate overfitting, a K-Fold cross-validation technique is used and along with it for developing and deploying advanced disease detection algorithm TensorFlow is utilized. Increasing population demands production, so this technique will not only boost the production but also, will reduce the time of production and so the workload.

Keywords:
Convolution, Neural Network, Deep Learning, Smart Farming, Tomato.

I. Introduction
In financial year 2023, the volume of tomato production in India is estimated to have amounted to over 20 million metric tons, Madhya Pradesh being the highest producer of tomato in India. As it is widely used the production directly affects the market. Increasing population which is directly proportional to demand leads to affect the supply chain. However, the upcoming technology like AI, ML made it easier than before to stable the market by stabilizing the demand supply chain.
Previously it was difficult to meet the demand, as farmers were unable to detect the disease itself, whereas now farmers not only detect but also classify the disease and accordingly treat it. Analyzing the root cause for the infected leaves, we get to know that tomato is warm season crop. So, best temperature for it ranges from 21-24°C. But changing climatic conditions due to global warming plants are getting more prone to diseases. In this, we have worked on 9 different diseases of tomato leaves namely- Bacterial Spot, Early Blight, L. Mold, Late Blight, Mosaic Virus, Septoria Leaf, Spider mite, Target Spot, Yellow Leaf and also healthy leaf.

a. Bacterial Spot b. Early Blight

Certificate Of Publication



Indian Institution of Industrial Engineering

BOMBAY

CERTIFICATE OF PUBLICATION

This is to certify that the article entitled

PLANT DISEASE DETECTION USING DL

Authored By

Tondare Ekta
Student of Engineering, E&TC Depart. Pune University

Published in

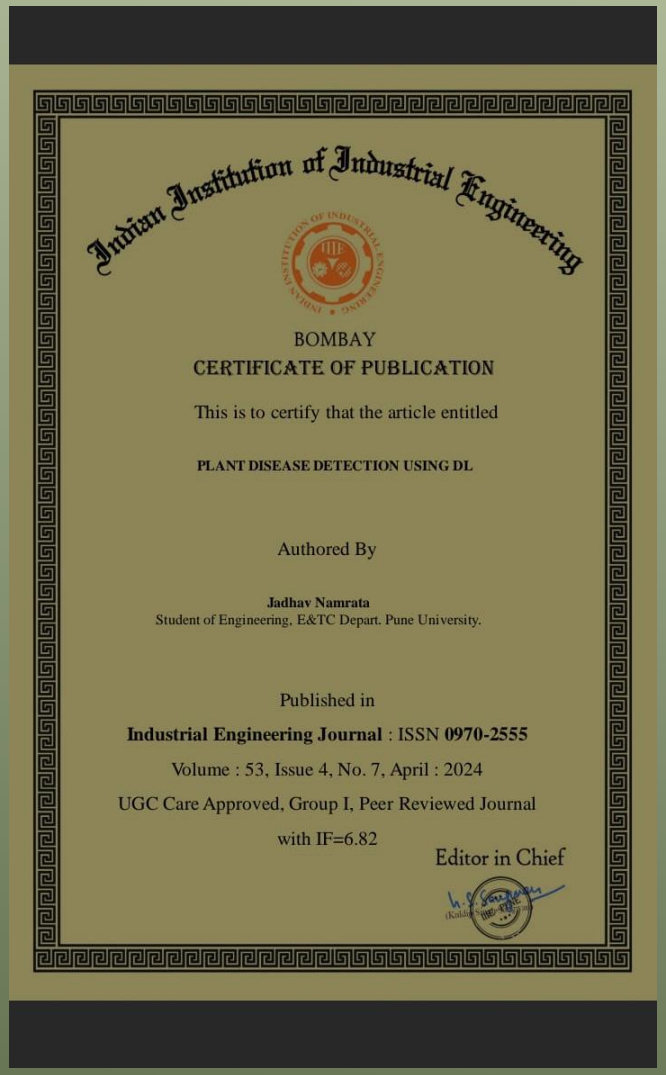
Industrial Engineering Journal : ISSN **0970-2555**

Volume : 53, Issue 4, No. 7, April : 2024

UGC Care Approved, Group I, Peer Reviewed Journal

with IF=6.82

Editor in Chief



Indian Institution of Industrial Engineering

BOMBAY

CERTIFICATE OF PUBLICATION

This is to certify that the article entitled

PLANT DISEASE DETECTION USING DL

Authored By

Jadhav Namrata
Student of Engineering, E&TC Depart. Pune University.

Published in

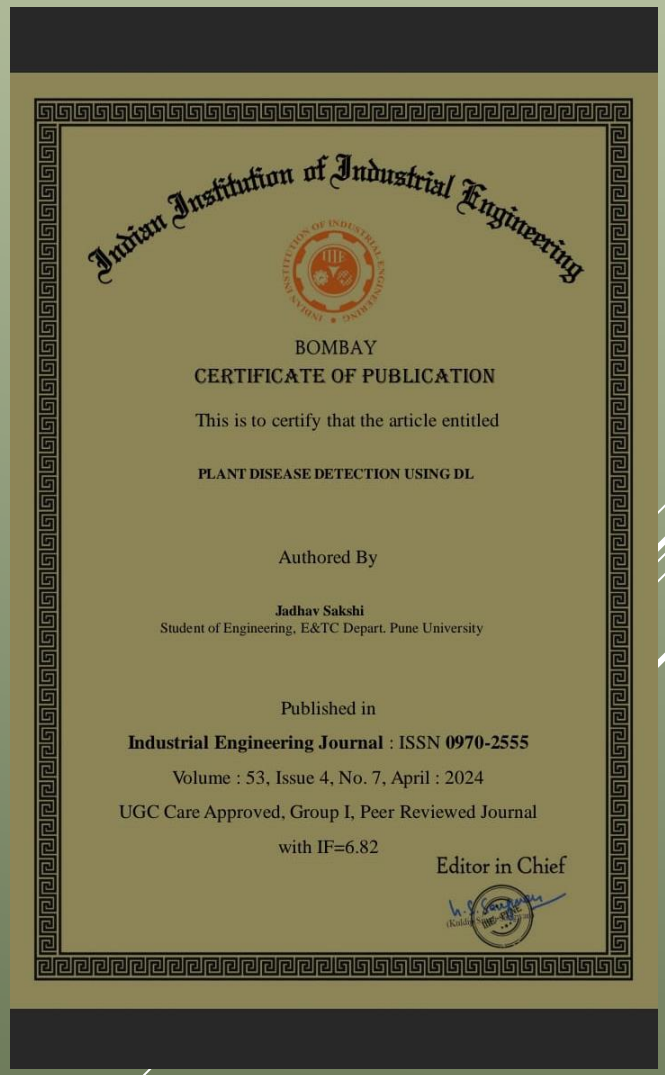
Industrial Engineering Journal : ISSN **0970-2555**

Volume : 53, Issue 4, No. 7, April : 2024

UGC Care Approved, Group I, Peer Reviewed Journal

with IF=6.82

Editor in Chief



Indian Institution of Industrial Engineering

BOMBAY

CERTIFICATE OF PUBLICATION

This is to certify that the article entitled

PLANT DISEASE DETECTION USING DL

Authored By

Jadhav Sakshi
Student of Engineering, E&TC Depart. Pune University

Published in

Industrial Engineering Journal : ISSN **0970-2555**

Volume : 53, Issue 4, No. 7, April : 2024

UGC Care Approved, Group I, Peer Reviewed Journal

with IF=6.82

Editor in Chief

Competition Certificate


KJ'S EDUCATIONAL INSTITUTES
TRINITY COLLEGE OF ENGINEERING AND RESEARCH, PUNE
PROJECT COMPETITION 2K24
13TH APRIL 2024
ORGANIIZED BY DEPPARTMENT OF ELECTRONICS AND TELECOMMUNIICATION
CERTIFICATE OF APPRECIATION
THIS CERTIFICATE IS PRESENTED TO
Tondare Ekta Yogiraj.
Successfully Participated in project competition event.
Project coordinator, E&TC
Dr. Shubhangi M. Handore
HOD, E&TC
Dr. Abhijeet Auti
Principal, TCOER


KJ'S EDUCATIONAL INSTITUTES
TRINITY COLLEGE OF ENGINEERING AND RESEARCH, PUNE
PROJECT COMPETITION 2K24
13TH APRIL 2024
ORGANIIZED BY DEPPARTMENT OF ELECTRONICS AND TELECOMMUNIICATION
CERTIFICATE OF APPRECIATION
THIS CERTIFICATE IS PRESENTED TO
Jadhav Sakshi Santosh.
Successfully Participated in project competition event.
Project coordinator, E&TC
Dr. Shubhangi M. Handore
HOD, E&TC
Dr. Abhijeet Auti
Principal, TCOER


KJ'S EDUCATIONAL INSTITUTES
TRINITY COLLEGE OF ENGINEERING AND RESEARCH, PUNE
PROJECT COMPETITION 2K24
13TH APRIL 2024
ORGANIIZED BY DEPPARTMENT OF ELECTRONICS AND TELECOMMUNIICATION
CERTIFICATE OF APPRECIATION
THIS CERTIFICATE IS PRESENTED TO
Jadhav Namrata Mohan.
Successfully Participated in project competition event.
Project coordinator, E&TC
Dr. Shubhangi M. Handore
HOD, E&TC
Dr. Abhijeet Auti
Principal, TCOER

Thank you!