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Leaf Disease Prediction Using CNN

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ABSTRACT

Plant disease is an ongoing challenge for smallholder farmers, which threatens income and food security. The recent revolution in smartphone penetration and computer vision models has created an opportunity for image classification in agriculture. Convolutional Neural Networks (CNNs) are considered state-of-the-art in image recognition and offer the ability to provide a prompt and definite diagnosis. In this paper, the performance of a pre-trained CNN model in detecting crop disease is investigated. The developed model is deployed as a web application and is capable of recognizing plant diseases out of healthy leaf tissue. A dataset containing leaf images; captured in a controlled environment, is established for training and validating the model. Validation results show that the proposed method can achieve an accuracy of 90% and an F1 score of greater than 92%. This demonstrates the technical feasibility of CNNs in classifying plant diseases and presents a path towards AI solutions for small holder farmers.

I. INTRODUCTION

Plants' leaves play a vital role in the survival of all organisms on Earth. Due to this fact, it is very important to ensure that measures are taken to detect and mitigate any diseases on plants. Plant leaf diseases are a major factor for crop losses in agriculture.Image classification has been around a very long time and also has been a popular field of research. Ifact, it has been implemented in a majority of major applications. In this project, we have implemented the same to solve the problem of plant leaf disease identification by analyzing the leaf from a plant using Convolutional Neural Networks (CNN).A major factor that supports the existence of life on earth starts from deep down in the food chain, the plants. All these plants are prone to various diseases because they are exposed to the various conditions of nature.The agricultural losses are huge because of many leaf diseases problems. Detecting and curing these diseases at a very rudimentary stage helps save a lot of money and effort.As a solution to this problem, we have devised a system that uses deep learning to analyze, detect and classify any disease that might have affected a plant by taking an image of the leaf.

II. PROBLEM FORMULATION

In the Agriculture field all farmers are facing the problem of plant disease.in olden days there are various ways to destroy these diseases but in technological time through detection we can easily detect which type of disease are available in particular plant.

III. PROPOSED SOLUTION

We planned to design the module so that a person with no knowledge about programming can also be able to use and get the information about the plant's disease. It proposed a system to predict leaf diseases. It explains about the experimental analysis of our methodology. Samples of 38 images are collected that are of different plant diseases like Tomato, Grape, Apple and Healthy Leaves. Different numbers of images are collected for each disease that was classified into database images and input images. The primary attributes of the image are based upon the shape and texture oriented feature.

Technologies used in the project

a) **Machine Learning**

Artificial intelligence (AI) is a subarea of computer science that emphasizes the creation of automated machines that work and react like humans. Machine learning system is a branch of artificial intelligence based on an idea that a system can produce general hypotheses by learning from data provided, identify patterns and make decisions with minimal human intervention. Machine learning is important because as models are exposed to new data, they are able to create a predictive model capable of inferring annotations for future data. They learn from Leaf Disease Prediction Using CNN previous computations to produce reliable, repeatable decisions and results without needing multiple manual edits to the program.

b) **Keras**

Keras is an open-source software library that provides a Python interface for artificial neural networks. Keras acts as an interface for the TensorFlow library. Up until version 2.3, Keras supported multiple backends, including TensorFlow, Microsoft Cognitive Toolkit, Theano, and PlaidML. c) **Kaggle**

Kaggle, a subsidiary of Google LLC, is an online community of data scientists and machine learning practitioners. Kaggle allows users to find and publish data sets, explore and build models in a web-based data-science environment, work with other data scientists and machine learning engineers, and enter competitions to solve data science challenges.

d) **TensorFlow**

TensorFlow is a free and open-source software library for dataflow and differentiable programming across a range of tasks. It is a symbolic math library, and is also used for machine learning applications such as neural networks. It is used for both research and production at Google. It is a standard expectation in the industry to have experience in TensorFlow to work in machine learning. TensorFlow was developed by the Google Brain team for internal Google use. It was released under the Apache 2.0 open source license on November 9, 2015.

e) **OpenCV**

OpenCV (Open Source Computer Vision Library) is a library developed by Intel for programming functions and is released under BSD license hence it's free for both academic and commercial use. It is a powerful library designed to work on real time applications with a strong real-time efficiency. It is written in C++ and its primary interface is based on C++ this makes OpenCV portable to almost any commercial system includes Python, JAVA, MATLAB/OCTAVE interfaces which are supported by Windows, Mac OS, iOS, Linux, FreeBSD, OpenBSD and Android as it was designed to be a cross-platform, the library can take advantage on multi-level processing thus makes it easy for businesses to utilize and modify the code.

IV. PROJECT SCOPE

The scopes of this project are:

1. Disease forecasting.
2. Disease prediction.
3. Disease recognition..
4. Disease detection.
5. Image processing.
6. Weather data.
7. Image Acquisition.

V. PROJECT OBJECTIVE

1.To detect unhealthy regions of plant leaves.
2.Classification of plant leaf diseases using texture features.
3.Coding is used to analyze leaf infection.

VI. HARDWARE REQUIREMENTS

The hardware requirements of this project are: -

a) Processor: Pentium, AMD or Higher Version

b) Operating System: Windows XP/ Windows 7/ Linux

c) RAM: 2GB recommended

d) Hardware Devices: Keyboard with mouse e) Hard disk: 10 GB or more

f) Display: Standard Output Display

g) Voice Input: Microphone (preferred)

VII. SOFTWARE REQUIREMENTS

The software requirements of this project are as follows: -

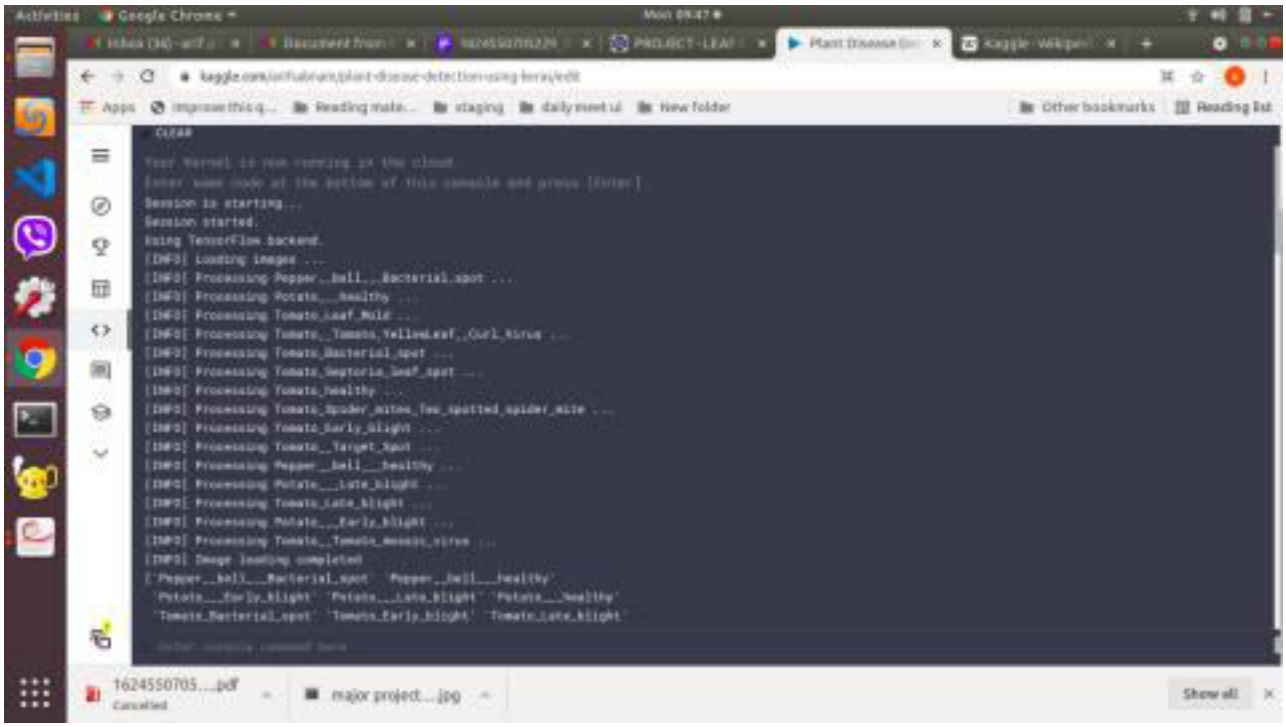
i) Python 3.6 is used in the CNN model.

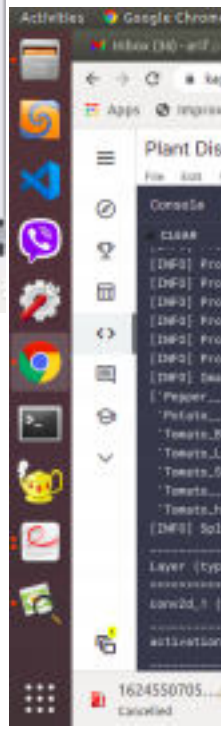
ii) Keras.

iii) Tenserflowlite.

iv)CNN and Kaggle.

VIII. SCREENSHOTS OF THE PROJECT





IX. CONCLUSION

This is to conclude that the project that we undertook was worked upon with a sincere effort.Most of the requirements have been fulfilled up to the mark and the requirements which have remaining, can be completed with a short extension.Our project is only a humble venture to satisfy the needs of a discussion forum at college level.Several user friendly coding have also adopted.The proposed system was developed taking in mind the benefits of the farmers and agricultural sector .The developed system can detect disease in plant and also provide the remedy that can be taken against the disease. By proper knowledge of the disease and the remedy can be taken for improving the health of the plant .The proposed system is based on python and gives an accuracy of around 78%.

Future Enhancements

Agricultural department wants to automate the detection of the yield crops from the eligibility process(real time).To automate this process by showing the prediction result in web application or desktop application. To optimize the work to implement in an Artificial Intelligence environment.

X. REFERENCES

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