



PLANT DISEASE DEDUCTION USING DEEP LEARNING

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Abstract: Agriculture plays a major role in human life. Almost 60% of the population is involved directly or indirectly in some agriculture activity. In the classical system no more technologies to detect the diseases regarding various crop in an agricultural environment, that's why farmers are not interesting to increase their agricultural productivity day by day. Crop diseases affect the growth of their respective species; therefore their early identification is very important. Many Machine Learning (ML) models have been employed for the detection and classification of crop diseases but, after the advancements in a subset of ML, that is, Deep Learning (DL), this area of research appears to have great potential in terms of increased accuracy. Here in the proposed system convolution neural network and Deep Neural Network can be efficiently and accurately detect and classify the symptoms of crop diseases. Moreover, several performance metrics are used for the evaluation of these techniques. This review provides a comprehensive explanation of DL models used to visualize crop diseases. In addition, some research gaps are identified from which to obtain greater transparency for detecting diseases in plants, even before their symptoms appear clearly. This proposed methodology aims to create an approach for plant leaf disease detection based on convolution neural network.

Index Terms- Deep Learning, plant disease, implementation, agriculture

I. INTRODUCTION

India is fast developing country and agriculture is the back bone for the countries development in the early stages. Agriculture is the main source of food, raw material and fuel which contributes to the economic development of a nation. Nearly 66% of the population depends on agriculture directly or indirectly. As there is a rapid growth in global population, agriculture is struggling to fulfil its necessity. Due to industrialization and globalization concepts the field is facing hurdles. On top of that the awareness and the necessity of the cultivation need to be instilled in the minds of the younger generation. Now a day's technology plays vital role in all the fields but till today we are using some old methodologies in agriculture. The food security remains threatened by various circumstances including climate change, the decline in pollinators, crop diseases, lack of irrigation, etc. Crop disease alleviates the production and also the quality of food. Crop diseases not only affect the food security at the global level, but it also has adverse consequences for small scale farmers whose income depends on healthy cultivation. There is an advantage that the crop diseases can be controlled by identifying the diseases as soon as it develops on crops. Due to advancement of internet, field of computer vision it has been possible to provide impactful solution to this problem. In olden days identification is done manually by the experienced people but due to the so many environmental changes the prediction is becoming tough. So image processing techniques is used for identification of plant disease. Generally it can be observed that the symptoms of disease on leaves, stems, flowers etc. so here leaves are used for identification of disease affected plants. Major features to foresee yield determination are crop health and progress in the seasonal changes. The crop yield goes through a cycle of changes which are associated with different environmental factors. Health of the crop yield and early detection of the plant disease are ways of good agriculture production. The crops are affected by different kind of anomalies present in the environment such as fungus, water deficiencies, insects and weed. These are certain types of problems because of which farmers are needed to use preventive measures to increase the productivity. This study helps to focuses on the visually targeted quality of crop. Advances in artificial intelligence researches now make it possible to make automatic plant disease detection from raw images. Deep learning can be thought as a learning method on neural networks. One of the advantages of deep learning is that it can extract features from images automatically. The neural network learns how to extract features while training. CNN is a multi-layer feed-forward neural network and is the popular deep learning model.

SYSTEM OVERVIEW

1 .IMAGE ACQUISITION:

The initial process is to collect the data from the public repository. It takes the image as input for further processing. We have taken most popular image domains so that we can take any formats like .bmp, .jpg, .gif as input to our process .The real time images are fed directly from the camera. For further analysis, proper visibility and easy analysis of images, white background is created because most of leaves colour varies from red to green for exact segmentation. This process, cotton images are acquired through a image capturing device. The image is taken in such a way to avoid any kind to distortion. The picture was taken under no direct sunlight as it would affect the image.

2. IMAGE PRE-PROCESSING:

As the images are acquired from the real field it may contain dust, spores and water spots as noise. The purpose of data pre-processing is to eliminate the noise in the image, so as to adjust the pixel values. It enhances the quality of the image. Image pre-processing is required to resize captured image from high resolution to low resolution. The image resizing can be done through the process of interpolation. Captured input image is being converted into a grayscale image using colour conversion by the equation. $Image = 0.3R + 0.59G + 0.11B$ the captured image placed in white background results in large differences between grey values of object and background. Also by using the application of computer vision technique to enhance the plant leave in order to detect diseases. Computer vision image enhancement (Colour conversion and Histogram equalization) can be detecting highly enhanced images with higher clarity than captured images. Captured infected plant leaves images can be diagnose using Grayscale translation and histogram equalization. The image of the cotton leaves are pre-processed through a series of processes namely image segmentation and feature extraction. This process is done so that it can be used in the process of back propagation of Neural Network.

3. IMAGE ENHANCEMENT:

The process of image enhancement is done by the method of noise cancellation. Noise cancellation is the method of correcting the pixel values that do not reflect the true intensities of the real scene. The background of the image is removed and is separated to the black background. To improve recognition rate in classification process Convolution neural network, deep neural network algorithms can also be used.

4. IMAGE SEGMENTATION:

Image segmentation is the process in which the binary image of the defected leaf is extracted. In this process a black and white image is formed. The defected part of the image is white and the background image is in black colour. The noise in the image is shown as small white pixel which is spread around the defected area. Disease Segmentation is an important step to make something that is more meaningful and easier to analyse. The goal of segmentation is to simplify or change the representation of an image into multiple analysis segments for further.

5. IMAGE ANALYSIS:

Image Analysis In this step, segmentation of images is done to find the region of interest. In segmentation, the technique used is region-based segmentation which separates healthy and diseased region of the plant leaf by using the colour of the leaf.

6. FEATURE EXTRACTION:

Feature Extraction is one of the most interesting steps of image processing to reduce the efficient part of an image or dimensionally reduction of interesting parts of an image as a compact feature vector. Feature reduction representation is useful when the image size is large and required to rapidly complete the tasks such as image matching and retrieval.

7. DISEASE CLASSIFICATION:

Classification of image consists of database that contains pre-defined patterns that are compared with detected objects to classify them in a proper category. Classification will be executed on the basis of spectral defined feature such as density, texture etc. Also the system suggests image classification using Convolution Neural Networks and Deep Learning, and it has introduced the Convolution Neural Network (CNN) as a new area in machine learning and is applied to crop plant disease through classification of image. To classify an image author, the system developed mobile application for infected crop disease, classification diagnosis crop plant with symptom of signatures disease, detection of signature disease that is expressed as a number of rules that concern the colour, the shape of the spots, historical weather data. It is based on mobile phone detection. Above developed application allows an agriculturist acting as an end user, extend or to customize the supported set of plant diseases.

SYSTEM DESIGN

DATA FLOW DIAGRAM

Data flow is the graphical representation of the "FLOW" of data through an information system. It differs from the dataflow as it shows the data flow instead of the control flow of the program

DFD Levels Context Level or Level 0

This level shows the overall context of the system and its operating environment and shows the whole system as just one process user register into the application and then and then get the response the entire application is installed on the mobile.

Top Level or Level 1

This level (level 1) shows all processes at the first level of numbering, data stores, external entities and the data flows between them. The purpose of this level is to show the major high level processes of the system and their interrelation. A process model will have one and only one level1 diagram. A level -1 diagram must be balanced with its parent context level diagram.

DATABASE DESIGN:

The general theme behind a database is to handle information in an integrated manner. There is none of the artificiality that is normally embedded in separate files or applications. A database is a collection of interrelated data stored with minimum redundancy to serve many users quickly and efficiently. The general objective is to make information access easy, quick, inexpensive and flexible for the user.

In a database environment, common data are available which several authorized users can use. The concept behind a database is an integrated collection of data and provides a centralized access to the data from the program.

It makes it possible to treat data as a separate resource.

While designing database, several objectives must be considered:

- Controlled redundancy
- Data Independence
- More information at low cost
- Accuracy and Integrity
- Recovery from failure
- Privacy and security
- Performance

Steps for Database Design

- State what kind of information we need to handle to get the desired output.
- Find out what information is needed for fields (i.e.) field type, size etc.
- Remove any data items, which is redundant.
- Tables have one to one relationships that need a primary key field.

FILE DESIGN:

The file system is used to control how data is stored and retrieved. Without a file system, information placed in a storage area would be one large body of data with no way to tell where one piece of information stops and the next begins. By separating the data into individual pieces, and giving each piece a name, the information is easily separated and identified. Taking its name from the way paper-based information systems are named, each group of data is called a file. The structure and logic rules used to manage the groups of information and their names are called a “file system”. There are many different kinds of file systems. Each one has different structure and logic, properties of speed, flexibility, security, size and more. Some file systems have been designed to be used for specific applications.

CODE DESIGN:

Code is an ordered collection of symbols designed to provide unique identification of an attribute. Codes can be used for various purposes. They can specify object’s physical or performance characteristics and they can be used to give operational instructions. They also can show inter relationships and may sometimes use to achieve secrecy or confidentiality. Codes are designed for optimum human-oriented use and machine efficiency. Codes possess uniqueness, expandability, conciseness, uniform nets, simplicity, versatility, sort ability, meaningfulness and operability.

Sufficient effort and time is spent in the preliminary study of the problem to design an efficient code. Activate serve scripting is object oriented. The source code is designed so that it can do transaction efficiently. It is the code that dose all the updating, modifications, etc. for all object used in the project there exist an associated source code, which explains the work of that object. It also describes the flow of the project.

Source code is enhanced by structured coding techniques by good internal comments and features provided by the language. The code design in this project is made modular. The modular behaviour enables easy debugging and testing. Inserting comment statement wherever enhances the coding. This is done during the documentation process coding is done in such a way that errors can be trapped easily. Also modifications can easily be appended due to the codes modular behaviour Tables have one to many relationship needs to add a foreign key field to the table to match the primary key field table.

FORM DESIGN:

FORMS:

A form is used to view and edit information in the database record by record .A form displays only the information we want to see in the way we want to see it. Forms use the familiar controls such as textboxes and checkboxes.

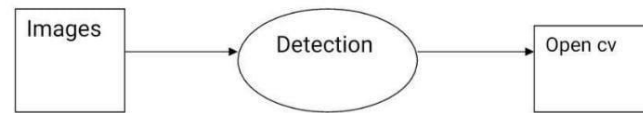
This makes viewing and entering data easy.

Views of Form:

Work with forms in several primarily there are two views are,

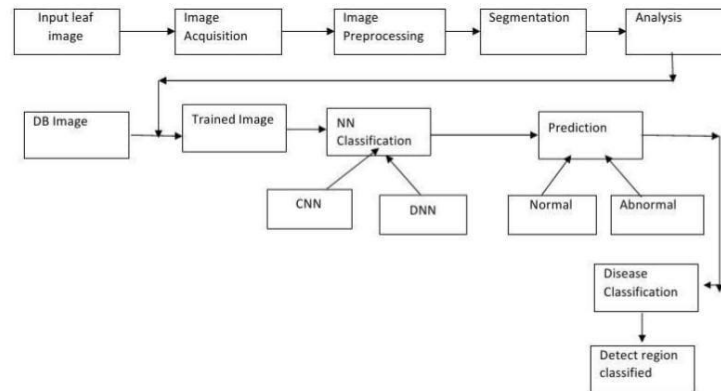
1. Design View
2. Form View
3. Design View

To build or modify the structure of a form, we work in forms design view. We can add control to the form that are bound to fields in a table or query, includes textboxes, option buttons, graphs and pictures.



Top Level or Level 1

This level (level 1) shows all processes at the first level of numbering, data stores, external entities and the data flows between them. The purpose of this level is to show the major highlevel processes of the system and their interrelation. A process model will have one and only one level1 diagram. A level -1 diagram must be balanced with its parent context level diagram.



SYSTEM IMPLEMENTATION:

Implementation is the process of converting a new or revised system design into an operational one. Thus it can be considered to be the stage in achieving a successful new system and it's vital to assure the user confidence that the proposed new system will never cause impairs and it will be effective. The implementation is not carefully planned and controlled, it can cause chaos

A software application in general is implemented after navigating the complete life cycle method of a project. Various life cycle processes such as requirement analysis, design phase, verification, testing and finally followed by the implementation phase results in a successful project management. The software application which is basically a web based application has been successfully implemented after passing various life cycle processes mentioned above.

As the software is to be implemented in a high standard industrial sector, various factors such as application environment, user management, security, reliability and finally performance are taken as key factors throughout the design phase. These factors are analysed step by step and the positive as well as negative outcomes are noted down before the final implementation.

The application's validations are made, taken into account of the entry levels available in various modules. Possible restrictions like number formatting, date formatting and confirmations for both save and update options ensures the correct data to be fed into the database. Thus all the aspects are charted out and the complete project study is practically implemented successfully for the end users.

The approaches of implementation are direct, parallel. In the first approach, the existing system is rejected and the new system is completely implemented. In a parallel approach both existing systems and new systems will be working simultaneously. Direct method of implementation is followed in this project.

SOFTWARE DESCRIPTION:

PYTHON:

Python is an interpreter, high-level, general-purpose programming language, created by Guido van Rossum and first released in 1991, Python has a design philosophy that emphasizes code readability, notably using significant whitespace. It provides constructs that enable clear programming on both small and large scales.

FEATURES OF PYTHON:

- Simple
- Robust
- Interpreted
- Object oriented
- Distributed
- Secure
- Architecture neutral
- Portable
- High performance
- Multithreaded.

DJANGO:

Django is a high-level Python web framework that enables rapid development of secure.

Built by experienced developers, Django takes care of much of the hassle of web development, so you can focus on writing your app without needing to reinvent the wheel. It is free and open source, has a thriving and active community, great documentation, and many options for free and paid-for support Django can be (and has been) used to build almost any type of website — from content management systems and wikis, through to social networks and news sites. It can work with any client-side framework, and can deliver content in almost any format (including HTML, RSS feeds, JSON, XML, etc.). The site you are currently reading is built with Django! Internally, while it provides choices almost any functionality you might want (e.g. several popular databases, tempting engines, etc.), it can also be extended to use other components if needed. Django code is written using design principles and patterns that encourage the creation of maintainable and reusable code. In particular, it makes use of the Don't Repeat Yourself (DRY) principle so there is no unnecessary duplication, reducing the amount of code. Django also promotes the grouping of related functionality into reusable "applications" and, at a lower level, groups related code into modules (along the lines of the Model View Controller (MVC) pattern. Django is written in Python, which runs on many platforms. That means that you are not tied to any particular server platform, and can run your applications on many flavours of Linux, Windows, and Mac OS X. Furthermore, Django is well-supported by many web hosting providers, who often provide specific infrastructure and documentation for hosting Django sites.

ANACONDA:

Anaconda is a distribution of the Python and R programming languages for scientific computing (Data science, machine learning applications, large-scale data processing, predictive analytics, Etc.) That aims to simplify package management and deployment. The distribution includes data science packages suitable for Windows, Linux, and macOS. It is developed and maintained by Anaconda, Inc., which was founded by Peter Wang and Travis Oliphant in 2012. [8] As an

Anaconda, Inc. product, it is also known as Anaconda Distribution or Anaconda Individual Edition, while other products from the company are Anaconda Team Edition and Anaconda Enterprise Edition, both of which are not free.

7. CONCLUSION:

The proposed system periodically monitors the cultivated field. Crop diseases are detected in early stage by using CNN and DNN algorithms. Machine learning techniques are used to train the model which helps to take a proper decision regarding the diseases. The pesticide as a remedy is suggested to the farmer for infected diseases to control it. In future the proposed system may be implemented by adding extra services like nearby government stores, price list for the pesticides, nearby open market and many more. This paper presents the survey on different diseases classification techniques used for crop disease detection and an algorithm for image segmentation technique that can be used for automatic detection as well as classification of plant leaf diseases later. Banana, beans, jackfruit, lemon, mango, potato, tomato, and sapota are some of those species on which proposed algorithm is tested. Therefore, related diseases for these plants were taken for identification. With very less computational efforts the optimum results were obtained, which also shows the efficiency of proposed algorithm in recognition and classification of the crop diseases. Another advantage of using this method is that the plant diseases can be identified at early stage or the initial stage. To improve recognition rate in classification process Convolution neural network and deep neural network algorithms can also be used.

Reference Books:

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