Deep Neural Networks Based Recognition of Plant Diseases and Processing Remedy by Leaf Image Classification

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Abstract: Agriculture is one field which has a high impact on life and economic status of human beings. The latest generation of Convolutional Neural Networks (CNNs) has achieved impressive results in the field of image classification. This paper is concerned with a new approach to the development of plant disease recognition model, based on leaf image classification, by the use of deep convolutional networks. Novel way of training and the methodology used facilitate a quick and easy system implementation in practice. The developed model is able to recognize 13 different types of plant diseases out of healthy leaves, with the ability to distinguish plant leaves from their surroundings. According to our knowledge, this method for plant disease recognition has been proposed for the first time. All essential steps required for implementing this disease recognition model are fully described throughout the paper, starting from gathering images in order to create a database, assessed by agricultural experts. Caffe, a deep learning framework developed by Berkley Vision and Learning Centre, was used to perform the deep CNN training.This work utilizes an open dataset of 5000 pictures of unhealthy and solid plants, where convolution system and semi supervised techniques are used to characterize crop species and detect the sickness status of 4 distinct classes.

Keywords: CNN, leaf disease, Classification, deep learning, remedies.

I.INTRODUCTION

System analysis is the process of separation of the substance into parts for study and implementation and detailed Examination. In this changing environment, appropriate and timely disease identification including early prevention has never been more important. There are several ways to detect plant pathologies. Some diseases do not have any visible symptoms, or the effect becomes noticeable too late to act, and in those situations, a sophisticated analysis is obligatory. However, most diseases generate some kind of manifestation in the visible spectrum, so the naked eye examination of a trained professional is the prime technique adopted in practice for plant disease detection. In order to achieve accurate plant disease diagnostics a plant pathologist should possess good observation skills so that one can identify characteristic symptoms. Variations in symptoms indicated by diseased plants may lead to an improper diagnosis since amateur gardeners and hobbyists could have more difficulties determining it than a professional plant pathologist. The next stage is to determine how the current system is physically implemented. The third step is the required logical system. Finally the required system can be developed. The system is performed by analyzing.

1.1 EXISTING SYSTEM

The effectiveness of the system depends on the way in which the data is organized. In the existing system, much of the data is entered manually and it can be very time consuming. Frequently accessing the records, managing of such type of records becomes more difficult in analysis. Therefore facing difficulty will happen organizing data.

1.2 PROPOSED SYSTEM

The proposed model is introduced to overcome all the disadvantages that arise in the existing system. This system will increase the accuracy of the disease detection and it will show the remedy to overcome the disease. It enhances the deep convolutional neural network will increase the performance.

II.LITERATURESURVEY

In the paper "The boosting approach to machine learning: An overview" in Nonlinear estimation and classification.*By* R.E.Scahpire Boosting is a general method for improving the accuracy of any given learning algorithm. Focusing on the AdaBoost algorithm by the starting, this paper overviews about the recent work on techniques in boosting including analyses of training error in AdaBoost's and adaptive generalization for error boosting's connection for gaming theory and linear programming; the relationship between boosting and logistic regression extensions of AdaBoost for multiclass classification problems; methods of incorporating human knowledge into boosting; and experi-mentaland applied work using boosting

In"Supportvectorclustering"byA.Ben-Hur,D.Horn,H.
T. Siegelmann, V.Vapnik Data points are mapped by means of a Gaussian kernel to a high dimensional feature space, where we search for the minimal enclosing sphere. The specified sphere, when mapped back to the space data, may separate into several individual components,in which each enclosing between a separate points of cluster. To identifying this simple algorithm for are developed.

In the paper "Land cover change assessment using decision trees support vector machines and maximum likelihood classification algorithms" by J. R. Otukei, T. Blaschke Land cover change assessment is one of the main applications of remote sensed data. A large number of pixel based algorithms classification has been developed for the past few years for the analysis in the remotely sensed data.

III.SOFTWARE DESCRIPTION

1.3 PYTHON

Python is a general-purpose more interactive, interpreted,, high-level, and object- oriented programming language. It was discovered by Guido van Rossum during the year 1985- 1990. Like Perl, this Python source code available under the GNU- General Public License (GPL), which gives proper understanding on language the Python programming. Python is a popular programming language. It was created in 1991 by Guido van Rossum. It is used for:
• mathematics
• web development (server-side, • System scripting • softwaredevelopment)

1.4 Anaconda Distribution

With over 6 million users, the open source Anaconda Distribution is the fastest and best way to make R data science and Python and machine learning on Mac OS X, Windows, and Linux. These are the industry standard for developing, training, and testing on a single machine.

1.5 Spyder

Spyder is an open source cross-platform integrated development environment (IDE) for scientific programming in the Python language.

2. FEASIBILITY STUDY

The study by feasibility is carried out for proposed system to test whether it is worth of being implemented. The proposed model will be selected based on if it is best enough for meeting the requirements of proper performance.

2.1 Economic Feasibility

Analysis based on economic is the most frequently used technique for evaluating performance and effectiveness of the proposed model. More commonly known as cost benefit analysis. This procedure determines the benefits and saving that are expected from the system of the proposed system. The hardware section in department of system if sufficient for development of system model.

2.2 Technical Feasibility

This study center around the system's department hardware, software and to what extend it can support the proposed system department is having the required hardware and software there is no question of increasing the cost of implementing the proposed system. The criteria, the proposed system is technically feasible and the proposed system can be developed

with the existing facility.

3. SYSTEM TESTING

System testing method is the special stage of implementation, ensuring that system model works more accurately and efficiently before the commence of live operation. Executing a program with the intent of finding an error is known as Testing. Finding an error is a good testing process that has a high probability. If the answers have yet undiscovered error then it is a successful test.

3.1 UNIT TESTING:

Unit testing is the technique of testing each given module and the integration process of the overall system separately. This type of unit testing becomes efforts in verification on the unit in range of smallest of software design in given module. This is also called as 'module testing'.

3.2 INTEGRATION TESTING:

Across an interface data can be lost, thus one module can have an adverse effect on the sub function on other side, when combined more, and the desired major function may not produce. This type of testing by integrated method is systematic form of testing that is done with sample data. To find the overall system performance the integrated test is needed. White Box testing method is a test case method of design that uses procedural design for the control structure to drive cases. Using the this type of methods using white box testing, a particular case of derivation of test cases that guarantee about all the individual paths within a module have been practiced at leastonce.

3.3 BLACK BOX TESTING:

Black box testing is done to find incorrect or missing function. Interface error. Errors in external database access. Performance errors. Initialization and termination errors

3.4 VALIDATION TESTING:

After the culmination of black box testing, software is completed assembly as a package, errors interfacing has been corrected and uncovered and final series of validation of software tests begin with testing for validation which can be defined as many number, but a description which is simple that succeeds in validation when functions of the software in a particular manner which can be reasonably done by customer expectation.

3.5 USER ACCEPTANCETESTING:

For the success of the system key factor is the user acceptance of the system. The system which is under consideration is tested for user acceptance with prospective system by constantly keeping in touch at the time of developing changes whenever required.

IV.SYSTEM MAINTENANCE

The phase of maintenance of the software cycle is the particular time in which performance of software having useful work. After the implementation of system successfully, maintenances should be done in a proper manner. In the software development life cycle system maintenance is an important aspect.Many resources can be found by searching across the Internet, but their relevance is often unreliable. In the interest of confirming the accuracy of classes in the dataset, initially grouped by a keywords search, agricultural experts examined leaf images and labelled all the images with appropriate disease acronym. As it is known, it is important to use accurately classified images for the training and validation dataset. Only in that way may an appropriate and reliable detecting model be developed. In this stage, duplicated images that were left after the initial iteration of gathering and grouping images into classes described in were removed from the dataset More than "finding mistakes" maintenance of software is of course, major work.

V.CORRECTIVE MAINTENANCE

The maintenance is the first activity which occurs due to it is unreasonable for assumption which in a large software system the software testing will uncover all latent errors. During the use of any big program, probably errors will occur in some range and can be reported to the concerned developer. The process which includes the diagnosis and proper correction of one or more errors is known as Corrective Maintenance.

VI.ADAPTIVE MAINTENANCE

The second most activity that is the contribution to a definition of maintenance occurrence because of the final rapid change which is encountered in every aspect of computation. Therefore maintenance by Adaptive method termed as an activity which modifies software to interfere properly with a environment changing is both commonplace and necessary.

VII.SYSTEM DEVELOPMENT

After the system designed physically in detail, the stage is to transfer the individual system into a one which is working. During which the design of a system is tested implementation is the stage of a project, then it is debugged and made it operational. So this is the most crucial stage which in achieving a successful new system and the users in giving confidence that the system which is new will work and be more effective.

3.6 **Modules***:*

3.6.1   DATA SELECTION AND LOADING: The image can be selected first and upload in the page. In this project, the leaf disease dataset is used for detecting the disease. This dataset contain the image of disease leaf and no disease imageleaf.Thedatasetcontainalltypeofleaf

9.2.2   DATA PREPROCESSING: This step is to verify the image that uploads in the process. In this verify image, the image can be verified by image color, image path of directory and image size. So this process can verify that the image is normal or blur .The clarity of image can be verifiedhere.

9.2.3   FEATURE EXTRACTION: Feature scaling technique. Feature scaling technique is a method to standardize the range of independent of variables or data features. In processing of data, it is also called as data normalization and properly performed generally during the steps of data pre-processing. Feature Scaling method or Standardization technique: It is a Data Pre Processing step of which is applied to variables that are independent or features of data. It helps basically to data normalizing within a particular range. Sometimes, thismethod also helps in increasing or speeding up the all calculations in an algorithmsimply.

9.1.4   ANALYSE THE IMAGE USING CNN ALGORITHM: In mostly neural networks, Convolutional neural network (ConvNets or CNNs) is one of the important categories to do recognition of images and classifications of images. CNN image classifications will take an input image, and process it and do classification under certain main categories. Convolution process is the first Layer to extract main features from an image at input. The relationship between pixels preserves by convolution by features using small squares of input data for learning image. It is a mathematical analysis operation that takes two basic inputs such as image in matrix and a filter or kernel form.

9.1.5   PREDICT THE DISEASE: It's a process of predicting the disease that what attack in a leaf. This project will effectively predict the data from dataset by enhancing the performance of the overall prediction results.

9.1.6   REMEDY FOR THE DISEASE: In this process the remedy is generated for the disease and it is show to the user. Then the result is shown that is healthy or not what disease occur and remedy is shown in that page. Then a percentage graph is shown for the image. In this process the remedy is generated for the disease and it is show to the user. Then the result is shown that is healthy or not what disease occur and remedy is shown in that page. Then a percentage graph is shown for the image.

VIII.SYSTEM IMPLEMENTATION

Implementation of software refers to the installation at final stage of packaging in its real environment, for the satisfaction of the users intended and the proper operation of the system. The people do not sure about whether the software is meant to make the job easier. Benefits of using the system should be known to the active user and must be aware of the system. Developing of confidence in the software will increase. Proper guidance is needed to the each user so that they will be more comfortable in using the application. Before viewing and going ahead of the system, the user must be aware that for viewing the accurate result, which the server program must be running in the particular server. If the object of server is not running on the server, the actual processes will be delayed or not take place.

IX.SAMPLE IMAGE AND FLOW DIAGRAM

3.7   AFFECTED LEAF

Bacteria are microscopic, single celled organisms that reproduce rapidly and cause a variety of plant diseases including leaf spots, stem root rots, galls, wilt, blight and cankers. They survive in infected plants, debris from infected plants, on or in seed, and in a few cases, infested soil. Plant pathogenic bacteria cause many different kinds of symptoms that include galls and overgrowths, wilts, leaf spot. Inside host cells In contrast to viruses that are, walled bacteria will grow in the spaces in between cells and do not fully invade them.

Fig-1. Figure caption of affected leaf.
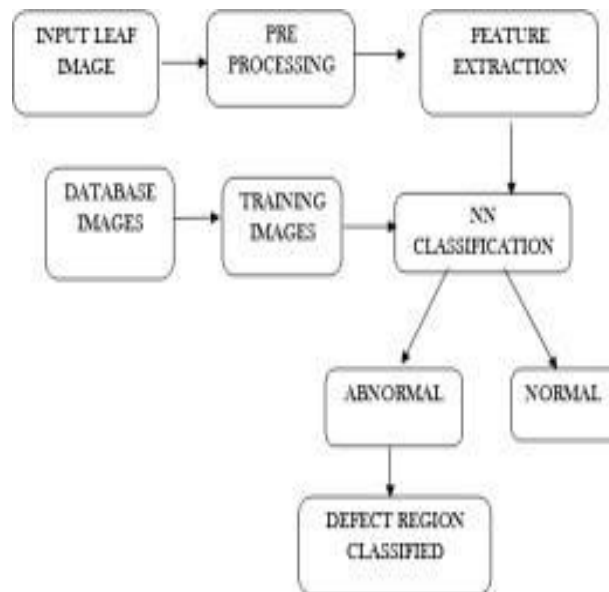
3.8   FLOW DIAGRAM

Fig.-2. Figure caption of Flow chart

A data-flow diagram (DFD) is a way special of representing data flow of a system (which is usually a system providing information) or a varying process. This category of data-flow diagram has no flow control, there are no loops and no decision rules. A data-flow diagram also provides various information about the inputsand outputs of the process and each entity of itself. Specific and individual operations based on the data can be represented by a flowchart.

CONCLUSION

Convolution neural network is used to detect and classify plant diseases. The Network is trained using the images taken in the natural environment and achieved 99.32Image classification, Image Categories, Feature Extraction, and Training Data is carried out. The whole development of algorithm is done in Python tool. Using several toolboxes like Statistics and Machine Learning toolbox, Neural Network Toolbox and Image Processing Toolbox the outputs as of now are the training data in form of image categories, image classification using K- Means clustering and moisture content along with predicting of withstanding.

Furthermore, future work will involve spreading the usage of the model by training it for plant disease recognition on wider land areas, combining aerial photos of orchards and vineyards captured by drones and convolution neural networks for object detection. By extending this research, the authors hope to achieve a valuable impact on sustainable development, affecting crop quality for future generations.

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