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E-Agri Kit Agricultural Aid using Deep Learning

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Abstract: *This project presents an agricultural aid application, developed and designed, to help farmers by utilizing Image Processing, Machine Learning and Deep Learning concepts. Our application provides features such as early detection of plant disease, implemented using various approaches. After evaluation, results showed that Convolutional Neural Network was performing better for plant disease detection with an high accuracy. It further helps the farmer to forecast the weather to decide the right time for agricultural activities like harvesting and plucking. To avoid reoccurrence of disease due to loss in soil minerals, a crop specific fertilizer calculator is incorporated which can calculate the amount of urea, diammonium phosphate and muriate of potash required for a given area.*

Keywords: Operating System: Windows, Coding Language: Python , Machine Learning, Deep learning

I. INTRODUCTION

According to a study by the Associated Chambers of Commerce and Industry of India, annual crops losses due to pests and diseases amount to Rs.50,000 crore ($500 billion), which is tantamount to a country where at least 200 million go to bed hungry every night [1]. Agriculture being a vital sector has a majority of the rural population in developing countries relying on it. The sector is faced by major challenges like unprecedented pest attack and unforeseen weather conditions affecting their produce leading to major loss of food and effort. Technology plays a vital role in uplifting the livelihoods of the rural populace which can be done by using a simple agroandroid application system. Plant diseases can affect vast produce of crops posing a major menace to food security as well as leading to major losses to farmers. An extensive review of existing research was conducted by us on this domain [5] and in an effort to help farmers overcome this problem, we have designed an android application, Agricultural Aid which utilizes machine learning to provide plant disease detection. This detection is combined with an android application which provides features like weather forecast of up to 7 days, fertilizer calculator and language translation in up to 4 languages which has been implemented and integrated using Android Studio and its APIs. For disease classification, we followed two approaches: Image Processing with Machine Learning and Deep Learning models.

The first approach i.e. Image Processing approach usually includes multi-step preprocessing techniques such as: Filtering, color space conversion, thresholding and finally, contouring to mark out the infected region. These methods can be used with Machine Learning concepts to provide classification of infected regions. However, the accuracy for such methods isn't very high. As an alternative to these steps, "GrabCut" Algorithm can also be used which is an optimized method of foreground extraction to eliminate background noises using minimal user interaction [4]. It has better accuracy in terms of background elimination and can be used for better classification however for the time being this method wasn't used in the application but can be incorporated in the future to improve accuracy. For the second approach i.e. Deep Learning approach, a deep neural architecture is used to train and test on leaf image databases to classify the disease. The paper provides a comparison of results obtained after applying Deep Learning Models such as CNN, ResNet-152 and Inception v3. In our agriculture aid, CNN Model is used to train and form an automated plant disease system based on images of leaves of both healthy and diseased plants

II. OBJECTIVE

The Indian agriculture desperately is lagging behind in per hectare yield in almost all crops in comparison to other countries with respect to the population that is needed to be fed. The use of technology in agriculture may help in increasing the productivity and may improve the condition of Indian farmers and protection of their product. The major

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problem of Indian agriculture is of providing information to the farmers and storing the crop related information at some place for analyzing later. The present paper illustrates a scheme of keeping records on the progress of agriculture, its production and farmers in India, via Cloud, exclusively employed for the welfare of the farmer society and the agricultural practices, GDP, and the cloud being open to general public as well, for studies, and process transparency. Agriculture has been the base for society and livelihood of the people. According to an estimate more than 60% of people are dependent on This app provides several useful insights to farmers like information related to crops, pesticides, insecticides, and financial sector details, etc. Expert planting tips like which crop to plant in summer, which crop to plant in spring, and which crop is suitable for a particular region, etc. are offered. Also information about current agricultural bank loan rates and schemes are provided. In this mobile app, a facility is provided to select a particular crop sowed by the user and once it is done, this app automatically briefs out all the diseases which are susceptible to that crop. An active Internet connection is required for fetching the information. The huge volumes of data are maintained in cloud storage. This application was developed using the latest Android SDK available at Google. Java and Eclipse Juno integrated with ADT plugin are also used. This app includes many screens like splash screen, state selection screen, menu item screen, etc. Previous studies show that mobile phones play a key role in promoting the farmer‟s business by providing improved customer relation, enhanced communication with suppliers, extension officers and customers agriculture for their livelihood

III. REQUIREMENTS

3.1 Software Requirements

Functional requirements for a secure cloud storage service are straightforward:

1. The service should be able to store the user's data
2. The data should be accessible through any devices connected to the Internet;
3. The service should be capable to synchronize the user's data between multiple devices (notebooks, smart phones,etc.)
4. The service should preserve all historical changes (versioning)
5. Data should be shareable with other users
6. The service should support SSO
7. The service should be interoperable with other cloud storage services, enabling data migration from one CSP to another

3.2 Hardware Requirements

- Processor – Pentium–II
- Speed – 2.4GHz
- RAM – 512 MB (min)
- Hard Disk – 20 GB
- Floppy Drive – 1.44MB
- Key Board – Standard Keyboard
- Monitor – 15 VGA Colour

It represents the situation where a class consists of several component classes. A class that is composed of other classes doesn't behave like its parts. It behaves very difficultly. The major properties of this relationship are transitivity and anti symmetry

IV. PROPOSED SYSTEM

The Deep Learning Approach, we decided to take a subset of the Plant Village dataset along with the cotton dataset to train and test the CNN model. The input image is fed into this model, which initially took a portion of the Plant Village and Cotton Dataset, with a training -validation split of 70-30, therefore getting 4200 images for training and 1800 images for validation. A CNN (Convolutional Neural Network) is a deep learning model that takes inputs which are assigned weights depending on various features. CNN is a widely used neural network for image-based datasets. Our CNN model consists of 4 main convolutional layers with 32, 64, 128, 128 filters consecutively, each followed by a

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ReLU activation function, max pooling and dropout layer. This set of convolutional layers is followed by a flatten and then a dense layer which is finally followed by the soft max activation function that tells us which class has the maximum probability.

4.1 Accuracy is Very High

The reason for choosing CNN algorithm is that it is more optimized and thus gives better background elimination results than the previous multistep approach

4.2 Algorithm Used

The questions whose answers will determine the distinction between the part and whole relationships are: Does the part class belong to the problem domain?
Is the part class within the system's responsibilities?
Does the part class capture more than a single value?(If not then simply include it as an attribute of the whole class)
Does it provide a useful abstraction in dealing with the problem domain?
There are three types of aggregation relationships. They are:
Assembly:
It is constructed from its parts and an assembly-part situation physically exists Container:
A physical whole encompasses but is not constructed from physical parts. Collection member:
A conceptual whole encompasses parts that may be physical or conceptual. The container and collection are represented by hollow diamonds but composition is represented by solid diamond

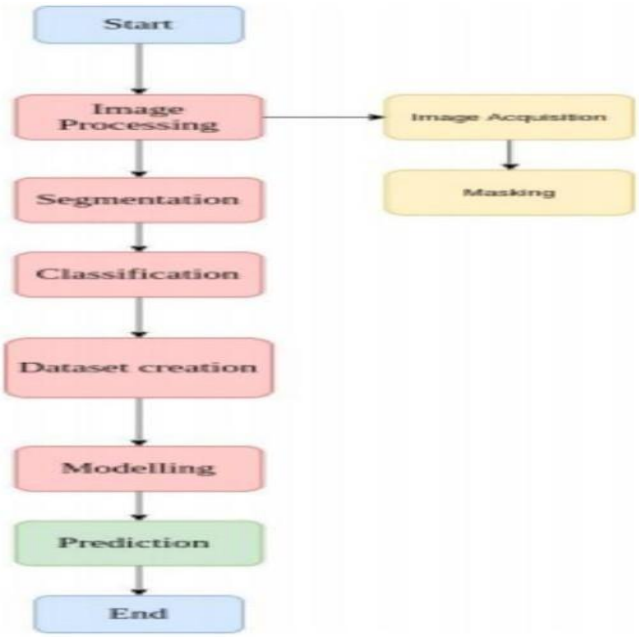

Fig. 1 Data Flow Diagram

V. IMPLEMENTATION

- Python is currently the most widely used multi-purpose, high-level programming language.
- Python allows programming in Object-Oriented and Procedural paradigms. Python programs generally are smaller than other programming languages like Java.
- Programmers have to type relatively less and indentation requirement of the language, makes them readable all the time.
- Python language is being used by almost all tech-giant companies like – Google, Amazon, Facebook, Instagram, Dropbox, Uber… etc.

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The biggest strength of Python is huge collection of standard library which can be used for the following –

- Machine Learning
- GUI Applications (like Kivy, Tkinter, PyQt etc.)
- Web frameworks like Django (used by YouTube, Instagram, Dropbox)
- Image processing (like OpenCV, Pillow)
- Web scraping (like Scrapy, Beautiful Soup, Selenium)
- Test frameworks Multimedia

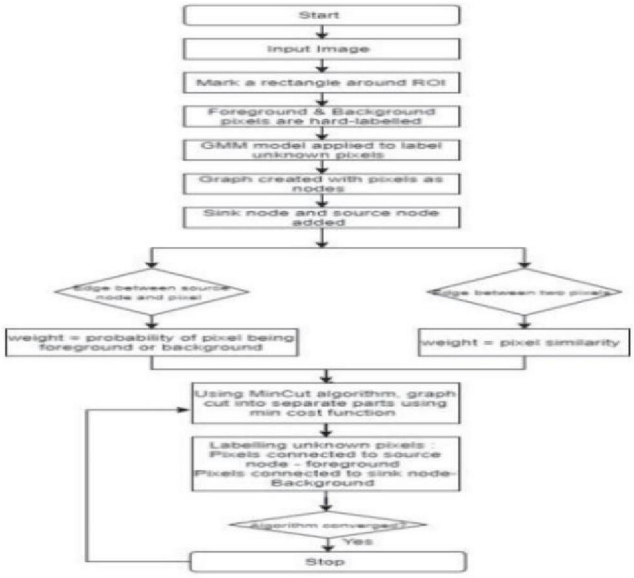

Fig. 2. Implementation Work

Architecture

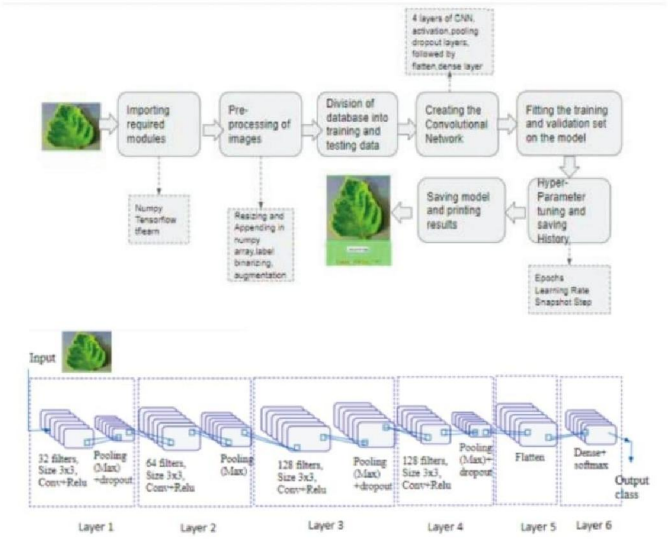

Fig. 3. Architecture of project

VI. OUTPUTS

Outputs from computer systems are required primarily to communicate the results of processing to users. They are also used to provide a permanent copy of the results for later consultation

The various types of outputs in general are:

- External Outputs, whose destination is outside the organization,.

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- Internal Outputs whose destination is within organization and they are the user's main interface with the computer.
- Operational outputs whose use is purely within the computer department.
- Interface outputs, which involve the user in communicating directly.
- Understanding user's preferences, expertise level and his business requirements through a friendly questionnaire.
- Input data can be in four different forms - Relational DB, text files, .xls and xml files. For testing and demo you can choose data from any domain. User-B can provide business data as input.

Fig. 4. Output Results

VII. CONCLUSION

During our analysis, we have understood the need for efficient plant disease identification & classification algorithms and prevention methods. Due to a large number of crops and diseases available, it is crucial that the detection system should be able to adapt to the changing variables and trends. Hence, Machine learning and Deep learning approaches were employed for this project which ensures that the code trains itself against as many possible numbers of different crops and diseases as possible The paper consists of an android application covering plant disease detection and other functionalities such as language translation, weather forecasting and fertilizer calculator. With this application we aim to provide aid in the unprecedented agricultural activities and ensure a healthy plant. Through our thorough literature review and robust implementation, we have tried several approaches as discussed above and chosen the best modelCNN with accuracy of 97.94 using 20 epochs. We have also tested our application on cotton dataset and performed realtime analysis on a diseased tomato crop to ensure our model does not overfit and performs well in a live environment. In future, we aim to expand our dataset to include more varied types of crops and disease so that the algorithm can adapt better to real time conditions and provide wide coverage

REFERENCES

[1]. CropLife International (May 2015). India's farmers fighting pests. Retrieved from: https://croplife.org/news/keeping-indias-pests-in-line/

[2]. Economic Times (Sept 2018). India sets record farm output target for 2018-19. Retrieved from: https://economictimes.indiatimes.com/news/economy/agriculture/indiasets-record-farm-output-target-for2018-19/articleshow/65858058.cms

[3]. Sharada P. Mohanty David P. Hughes and Marcel Salathé."Using Deep Learning for Image-Based Plant Disease Detection."Front. Plant Sci., 22 September 2016

[4]. Carsten Rother, Vladimir Kolmogorov, and Andrew Blake. 2004. "GrabCut": interactive foreground extraction using iterated graph cuts. In ACM SIGGRAPH 2004 Papers (SIGGRAPH '04). Association for Computing Machinery, New York, NY, USA, 309–314.

[5]. R. Chapaneri, M. Desai, A. Goyal, S. Ghose and S. Das, "Plant Disease Detection: A Comprehensive Survey," 2020 3rd International Conference on Communication System, Computing and IT Applications (CSCITA),Mumbai, India, 2020, pp. 220-225, doi: 10.1109/CSCITA47329.2020.9137779.

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[6]. Raghavendra, B. K. (2019, March). Diseases Detection of Various Plant Leaf Using Image Processing Techniques: A Review. In 2019 5th International Conference on Advanced Computing & Communication Systems (ICACCS), (pp. 313-316). IEEE.

[7]. Malathi, M., Aruli, K., Nizar, S. M., & Selvaraj, A. S. (2015). A Survey on Plant Leaf Disease Detection Using Image Processing Techniques. International Research Journal of Engineering and Technology (IRJET), 2(09)

[8]. Kaur, S., Pandey, S., & Goel, S. (2018). Semi-automatic leaf disease detection and classification system for soybean culture. IET Image Processing, 12(6), 1038-1048.

[9]. Patil, S., & Chandavale, A. (2015). A survey on methods of plant disease detection. International journal of Science and Research (IJSR), 4(2), 1392-1396.

[10]. Rathod, A. N., Tanawala, B. A., & Shah, V. H. (2014). Leaf disease detection using image processing and neural network. International Journal of Advance Engineering and Research Development (IJAERD), 1(6).

[11]. "Computational Vision and Bio-Inspired Computing", Springer Science and Business, Media LLC, 2020