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An AI-Powered Mobile Application for Crop Disease Detection Using MobileNetV2 and Flutter

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Abstract- Agriculture forms the basis of the Indian economy. However, crop disease has been a major problem in reducing crop yields. Small and marginal farmers cannot get expert advice in time. In this paper, we propose a mobile application known as SmartAgri Doctor, implemented using Flutter and TensorFlow Lite, to detect crop diseases in real time. The proposed system works on the concept of transfer learning with MobileNet V2 and the Plant Village dataset to detect diseases in crops like tomato, rice, brinjal, and sugarcane. TensorFlow Lite's model is quite light, and the proposed system runs in full offline mode. Once the disease has been identified, recommendations are provided for both organic and chemical treatments depending upon the severity of the disease. The results show that the validation accuracy of the proposed system is around 93.5%. It runs in real time and can be executed in normal Android devices. The proposed system provides a scalable, accessible, and sustainable solution for smart agriculture.

Keywords- Crop Disease Detection, MobileNet V2, TensorFlow Lite, Flutter, Smart Agriculture, On-Device AI, Plant Village Dataset

I. INTRODUCTION

Agriculture is one of the major contributors to India's Gross Domestic Product and is still a primary source of livelihood for a considerable portion of the population. Nevertheless, with all the advances in technology, diseases in plants still pose a serious threat, resulting in a loss of 20-40% of crops worldwide.

In rural areas such as Tamil Nadu, early detection of diseases is a problem due to inaccessibility to agricultural experts. Conventional methods of detection are often time-consuming, expensive, and reactive in nature, rather than preventive.

With advances in deep learning and mobile technology, there is an opportunity to solve this problem by using computer vision technology to detect diseases in crops in real time.

SmartAgri Doctor is a proposed system that utilizes deep learning and mobile technology to offer:

- Real-time detection of diseases in crops
- Offline capabilities without the need for internet connectivity
- Organic remedies
- User interface designed for farmers

II. LITERATURE REVIEW

Deep learning techniques have been identified as efficient techniques for the detection of plant disease using images. Sharada P. Mohanty et al. (2016) reported the accuracy of deep learning techniques, specifically CNN, using the PlantVillage dataset, even though the accuracy is lower when implemented in real-time. Konstantinos P. Ferentinos (2018) reported that deep learning techniques are more accurate when compared to traditional techniques, specifically SVM and Random Forests.

Mohamed Brahimi et al. (2017) reported the implementation of deep learning techniques, specifically CNN, for tomato disease detection and reported the problems associated with the implementation of deep learning techniques in mobile devices. For improving the efficiency of deep learning techniques, Andrew G. Howard et al. (2017) reported the implementation of MobileNet, and Mark Sandler et al. (2018) reported the improvement to the model.
The existing systems are not region-specific and are implemented in cloud computing, whereas the SmartAgri Doctor is implemented offline and is region-specific

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III. PROBLEM STATEMENT

Agriculture is one of the main sources of livelihood for a large population in India, especially in rural areas like Tamil Nadu. Nevertheless, one of the major challenges facing agriculture in such regions is crop diseases, which often result in economic loss. Accurate and timely detection of plant diseases is critical. However, most people in rural regions cannot access agricultural experts. Traditional methods of detecting plant diseases are mostly manual. This process is often time-consuming and may be associated with human error. Moreover, such facilities may not be available in rural regions.

Most existing digital platforms for detecting plant diseases are based on cloud technology. This implies that a strong internet connection is required. This may not be available in rural regions. Moreover, such platforms may not be compatible with mobile technology or region-based crops and remedies. There exists a need to develop a solution that can accurately detect plant diseases in real time, utilizing readily available smartphone technology. This solution should be lightweight, such that it can be used offline.

IV. OBJECTIVE

The main objective of the work is to build a mobile application named SmartAgri Doctor, which can be used to detect diseases in plants in real time by taking images of plants using a smartphone. The system also attempts to implement a MobileNetV2 model using TensorFlow Lite, which can be used to make predictions even without an internet connection. This is necessary since an internet connection may not be available in rural areas.

Another objective of the work is to achieve a high level of accuracy in disease classification. This has been attempted by using transfer learning. The mobile application also attempts to provide practical advice by suggesting organic as well as chemical methods of disease cure. More emphasis has been given to organic methods.

Furthermore, the system also attempts to provide a user-friendly interface to cater to the needs of farmers, as most farmers may not have adequate knowledge about technology. Also, the system attempts to provide support for crops that are commonly grown in the region.

Thus, the main objective of the work is to reduce the loss of crops and increase production by helping farmers through an intelligent system.

V. SYSTEM ANALYSIS

The proposed system, "SmartAgri Doctor," tries to solve the limitations associated with traditional approaches used to identify crop disease. Traditional approaches either take a long time or use a cloud application, which relies on an internet connection. This may cause problems for people in rural areas.

The proposed system uses an efficient approach to identify the disease. This approach uses a MobileNetV2 TensorFlow Lite model. This approach helps the system to process the input image of leaves in a short time. This approach does not require a lot of system requirements. The image may be obtained from a smartphone’s gallery or camera.

The proposed system uses a local database to store information about diseases and remedies. The requirements of the proposed system are to provide a high level of accuracy, low latency, and a user-friendly interface. This system can run on low-end devices. The proposed system is efficient.

A. Existing System

The existing system of crop disease detection relies on conventional methods such as crop observation by the farmer or consulting a person experienced in the field of agriculture. This process is a lengthy one, and there exists a high scope of error if the farmer is unaware of the crop disease and its development stage.

Furthermore, there exist a few modern crop disease detection systems utilizing machine learning technology and mobile app technology. However, most of the existing systems are based on cloud technology, which demands constant internet connectivity. This is a drawback since internet connectivity in rural areas is extremely poor.

Furthermore, a few application programs exist in the domain of crop disease detection. However, such application programs are not compatible with low-end devices, and region-based crops and remedies

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cannot be obtained, which is a drawback for rural farmers.

B. Proposed System

The proposed system, SmartAgri Doctor, is a mobile application that uses Artificial Intelligence for real-time and offline crop disease detection and remedy suggestions. The proposed system is different from existing systems in the sense that it does not need an Internet connection to provide the services and can be effectively utilized by farmers in the rural regions.

The proposed system uses a MobileNetV2 TensorFlow Lite model for image classification and provides the suggestions for the crop diseases detected by the system. The image classification process starts with the image acquisition by the farmer and the upload of the image to the proposed system. After the image acquisition and upload, the image classification process starts by preprocessing the image and classifying the image into different classes.

Based on the image classification result, the proposed system provides the suggestions for the crop diseases detected by the system and the organic and chemical remedies for the diseases detected by the system. The proposed system also provides the history of the scan performed by the farmer and the suggestions for the crop management process.

C. System Architecture

The system architecture of SmartAgri Doctor is designed to efficiently support crop disease detection in an offline and real-time manner on mobile devices. It consists of three layers, namely, the User Interface Layer, the Processing Layer, and the Data Layer.

The User Interface Layer, implemented using Flutter, provides a user interface to the farmer to efficiently capture or upload images of leaves, predict diseases, and obtain remedies.

The Processing Layer is responsible for image processing, such as resizing, normalizing, and augmenting, and performs predictions using a pre-trained MobileNet V2 TensorFlow Lite model, which is implemented on the mobile device to obtain predictions of disease labels and confidence scores.

The Data Layer consists of a pre-trained model file, a class labels file, and a local database to store disease-related information and remedies in a JSON file, and SQLite is used to store scan history to track disease over time.

The system architecture is designed to efficiently support crop disease detection in an offline and real-time manner on mobile devices, and it is modular in nature to add more crops and diseases in the future.

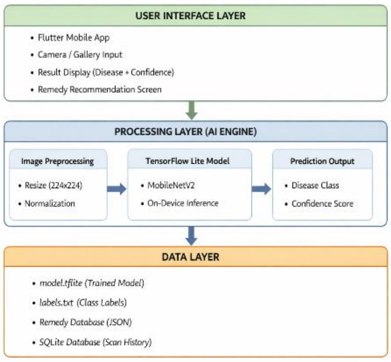

Fig 1.1 frame work of system Architecture

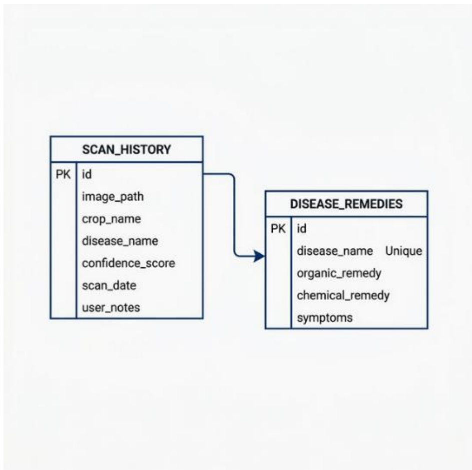

Fig 1.2 Enhanced Database Design with Attribute Descriptions

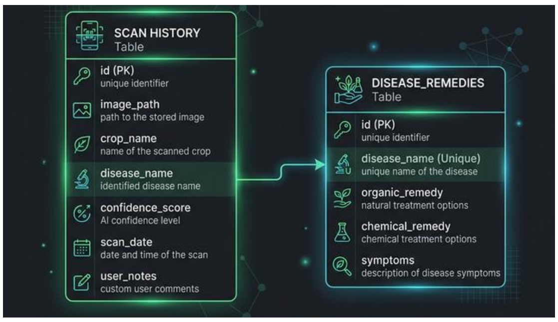

Fig 1.3 Overall System Architecture and Workflow of SmartAgri Doctor

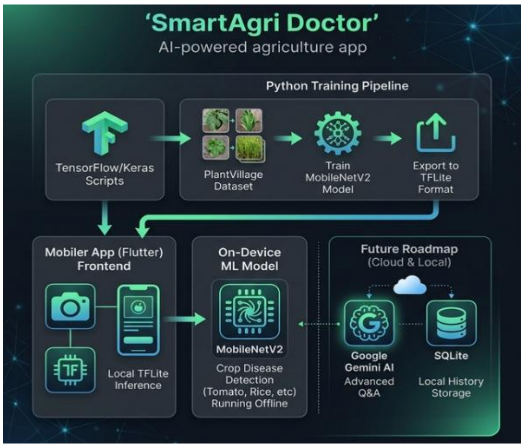

Fig 1.4 Disease Detection Result Interface of SmartAgri Doctor

VI. IMPLEMENTATION AND RESULTS

The implementation of the SmartAgri Doctor system requires the integration of deep learning, mobile app development, and device inference technologies to provide a complete system for crop disease detection. The system is implemented using the Flutter framework to develop a cross-platform mobile app with a responsive user interface. The deep learning model is implemented using MobileNetV2, which utilizes transfer learning with the Plant Village dataset. The model is implemented in Python, utilizing TensorFlow and Keras frameworks, along with image preprocessing, resizing, normalization, and augmentation to increase model performance.

The model is then converted to TensorFlow Lite format to run the model on the device. The mobile app utilizes TensorFlow Lite to run the model, implemented using the tflite_flutter package.

The app utilizes the camera plugin to capture the image, and the image picker plugin to select the image from the device gallery. The captured image is then preprocessed, and the model predicts the output based on the image provided to it.

Results

The proposed system, i.e., SmartAgri Doctor, was tested using the PlantVillage dataset containing 54,309 images from 38 disease classes. When tested on the MobileNetV2 model, a training accuracy of 95.2% was obtained along with a validation accuracy of 93.5%. This proves that the model has a strong ability to generalize. When tested on the converted TensorFlow Lite model, a high accuracy was obtained along with a model size of approximately 8 MB. This proves that our model can be easily deployed on mobile platforms. When tested on Android-based platforms, our application was found to provide results in real time within an average time of 150-200 milliseconds. Our system was able to successfully identify images from both camera and gallery. Moreover, our remedy recommendation component was able to provide appropriate remedies based on the disease detected. This proves that our system is efficient, accurate, and can be successfully implemented in the agricultural domain. This would be particularly helpful in rural regions where internet connectivity may not be available. This would help in efficient decision-making, thus reducing any loss of crops.

VII. FUTURE WORK

Although the SmartAgri Doctor tool has shown good performance in the real-time detection of crop diseases, there are many improvements that can be made to the tool to enhance its performance and reach. One such improvement that can be made is the inclusion of multilingual support for different languages such as Tamil and the inclusion of Text-to-Speech functionality.

The tool can be enhanced to support different crops and diseases by training the tool with different datasets and making it more robust for different environmental conditions. The tool can also be enhanced by the inclusion of hardware acceleration techniques such as GPU and NNAPI, which can improve the performance of the tool.

Another such improvement that can be made to the tool is the inclusion of weather-based disease prediction by fetching the data from external APIs and the inclusion of generative AI and chatbots for the provision of personalized services to farmers.

The tool can also be enhanced by the inclusion of cloud sync features and the inclusion of the iOS platform for the tool to reach a wide variety of users and different user groups.

VIII. CONCLUSION

In this paper, an AI-based mobile application named SmartAgri Doctor was discussed. This application helps in real-time crop disease detection. By utilizing MobileNetV2 and TensorFlow Lite, efficient disease classification is achieved.

With a validation accuracy of 93.5%, this solution has great scope to aid farmers in early disease detection, resulting in increased agricultural growth.

REFERENCES

[1] FAO, "The State of Food and Agriculture 2019," Food and Agriculture Organization of the United Nations, Rome, 2019.

[2] S. P. Mohanty, D. P. Hughes, and M. Salathé, "Using deep learning for image-based plant disease detection," Frontiers in Plant Science, vol. 7, p. 1419, 2016.

[3] K. P. Ferentinos, "Deep learning models for plant disease detection and diagnosis," *Computers and Electronics in Agriculture*, vol. 145, pp. 311–318, 2018.

[4] M. Brahimi, K. Boukhalfa, and A. Moussaoui, "Deep learning for tomato diseases: classification and symptoms visualization," *Applied Artificial Intelligence*, vol. 31, no. 4, pp. 299–315, 2017.

[5] A. G. Howard, M. Zhu, B. Chen et al., "MobileNets: Efficient Convolutional Neural Networks for Mobile Vision Applications," arXiv preprint arXiv:1704.04861, 2017.

[6] M. Sandler, A. Howard, M. Zhu, A. Zhmoginov, and L.-C. Chen, "MobileNetV2: Inverted Residuals and Linear Bottlenecks," in *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2018, pp. 4510–4520.

[7] D. P. Hughes and M. Salathé, "An open access repository of images on plant health to enable the development of mobile disease diagnostics," *arXiv preprint arXiv:1511.08060*, 2015.

[8] Google, "TensorFlow Lite: On-device ML for mobile and edge devices," TensorFlow Documentation, 2019. [Online]. Available: https://www.tensorflow.org/lite

[9] Google, "Flutter: Build apps for any screen," 2019.

[10] J. G. A. Barbedo, "Impact of dataset size and variety on the effectiveness of deep learning and transfer learning for plant disease classification," Computers and Electronics in Agriculture, vol. 153, pp. 46-53, 2018.

[11] S. Sladojevic et al., "Deep neural networks based recognition of plant diseases by leaf image classification," Computational Intelligence and Neuroscience, vol. 2016, Article ID 3289801, 2016.

[12] P. Too, S. Yujian, L. Njuki, and Y. Yingchun, "A comparative study of fine-tuning deep learning models for plant disease identification," Computers and Electronics in Agriculture, vol. 161, pp. 272-279, 2019.

[13] M. E. Paoletti et al., "Deep learning classifiers for hyperspectral imaging: A review," ISPRS Journal of Photogrammetry and Remote Sensing, vol. 158, pp. 279-317, 2019.

[14] S. Ramesh and D. Vydeki, "Recognition and classification of paddy leaf diseases using optimized deep neural network with Jaya algorithm," Information Processing in Agriculture, vol. 7, no. 2, pp. 249-260, 2020.

[15] A. Kamilaris and F. X. Prenafeta-Boldú, "Deep learning in agriculture: A survey," Computers and Electronics in Agriculture, vol. 147, pp. 70-90, 2018.