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Krushi Sevaka

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Abstract: *The condition of the agriculturist in India today is very unfavourable. There are many reasons for this situation. One is various diseases in crops and the other is premature change. Climate change is natural and unstoppable but its effects can certainly be mitigated downwards. The proposed system "KRUSHI SEVAKA" offers a solution to this problem. The plan aims to reduce the farmer's workload, simplify his daily tasks, and ultimately increase crop yields. Firebase is used for authentication and real-time database facilitating backend operations. To determine the nearest location, the system uses custom zip codes that provide the latitude or longitude of the zip code and other information.*

Keywords: Farmer, Weather, Location, Government Services, Android.

I. INTRODUCTION

In latest years, the agricultural quarter has witnessed a substantial shift in the direction of the adoption of modern-day technologies to enhance productivity and efficiency. Machine Learning (ML) strategies have emerged as a effective tool inside the agricultural area, permitting farmers and stakeholders to make facts-pushed selections and optimize their practices. This creation offers an outline of a mobile application advanced using Flutter, which leverages ML strategies to enhance agricultural productiveness.

Mobile Application Overview:

The cell software is designed to provide farmers with a user-friendly and available platform to harness the energy of ML for optimizing agricultural strategies. Developed using the Flutter framework, the software gives go-platform compatibility, ensuring that users can get entry to it on both Android and iOS gadgets seamlessly.

Key Features:

- Crop Disease Identification: The ML algorithms integrated into the software enable farmers to hit upon and identify crop diseases correctly. By studying photos of affected vegetation, the app can provide instant analysis, allowing farmers to take instant motion and prevent in addition harm.
- Yield Prediction: Leveraging ancient records and ML fashions, the application gives yield prediction talents. By inputting applicable facts including potassium, nitrogen and phosphorus content in soil and climate conditions, farmers can obtain estimates of future crop yields. This aids in planning andallocation, optimizing productivity and profitability.
- Weather Forecasting: The software integrates real-time climate records and ML algorithms to offer correct and localized weather forecasts. Farmers can get entry to up-to-date statistics on temperature, rainfall, humidity, and other critical parameters, aiding in timely decision-making concerning irrigation, harvesting, and crop safety.
- Rentals: This section of the projectis designed to provide assistance to small-scale farmers who often face difficulties in accessing agricultural equipment due to financial constraints. One of the key features of the application is the rental service, which allows poor farmers to access large machinery such as tractors and irrigation equipment from rich farmers in their location.
- This rental service not only provides an opportunity for small farmers to access expensive agricultural equipment but also allows the rich farmers to earn additional income from their machinery during the off-

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season. The application offers a user-friendly interface that enables farmers to search for available equipment in their area, check its availability and rental price, and reserve it for a specific period.

- Smart connect: This section of the project is designed to provide a platform for farmers to directly sell their crops to consumers. which enables farmers to bypass intermediaries and sell their produce directly to consumers. Consumers can then browse through the available crops, view their details, and place an order for the desired quantity. The farmer is then notified of the order and can directly communicate with the consumer to finalize the sale and arrange for delivery or pickup.

This system helps farmers to get a fair price for their crops by eliminating intermediaries who often take advantage of the farmer's lack of market knowledge and bargaining power. It also helps consumers to get fresh, high-quality produce directly from the source, thereby reducing the time and cost involved in the traditional supply chain.

II. PROJECT PURPOSE

The main purpose of the project is to develop a mobile application that would be a one stop for farmer's productivity. There are no existing systems for the productivity of farmers, if exists there are no android applications. There are few websites that are involved with the predicting the proper crop at the current climatic conditions and detection of the disease in the plant. Usually the farmer uses his studied knowledge.

The farmers would not have information about the essential sources and effect on soil if continuously sown with the identical seeds over some years. Since, there is loss of sources and understanding. The farmer have to put on loads of efforts on proper decision making , that would effect the production.

The proposed system *"KRUSHI SEVAKA"* is developed mainly to address such problems in the way of developing a android application which helps farmers to get availability of all the resources and suitable for the precise location and climatic conditions. This project helps the farmer in reduce efforts of the farmer and increases the yield thereby saving the money and time, and also helps in effective usage of assets and money. Along with this information, the device assists the farmer in selling his crop directly to the consumer and get the large machineries on rent.

III. LITERATURE SURVEY

[1] "Secure OTP Authentication for Mobile Applications using Firebase and Flutter" by R. Krishnamoorthy and R. Prasanna. This paper proposes a secure OTP authentication mechanism for mobile applications using Firebase and Flutter. The authors explain the process of generating and validating OTPs using Firebase Authentication services.

The author starts by discussing the importance of user authentication in mobile applications, especially in sensitive domains such as finance, healthcare, and e-commerce. The authors then introduce the concept of OTP authentication, which involves sending a one-time password to the user's registered mobile number or email address, which the user then inputs to authenticate their identity.

[2] "Crop Classification Using Machine Learning Algorithms: A Comprehensive Study" by V. P. M. P. Namburu, G. P. Hancke, and J. P. Meyer (IEEE Access, 2021)The authors begin by introducing the importance of crop classification in precision agriculture, which helps farmers make informed decisions about crop management. They then discuss the various types of data that can be used for crop classification, including remote sensing data, weather data, and soil data.

The authors go on to provide an overview of various machine learning algorithms, including decision trees, k-nearest neighbors, support vector machines, and neural networks. They also discuss feature selection and feature engineering techniques to improve the accuracy of machine learning models.

[3] "A Comprehensive Survey on Convolutional Neural Network in Agriculture" by P. V. Pankajakshan, S. D. Nair, and R. K. Baby (International Journal of Innovative Technology and Exploring Engineering, 2019)

[4] "Deep Learning for Agriculture: A Survey" by R. A. C. Azevedo, E. Velloso, M. S. Silva, and M. M. Morais (arXiv preprint arXiv:2012.01207, 2020)

[5] "A Comprehensive Survey on Deep Learning for Plant Identification" by R. Shukla, G. Mittal, and N. Khandelwal (Computers and Electronics in Agriculture, 2021)

[6] "Deep Learning for Plant Diseases Detection: A Comprehensive Survey" by P. Sharma and P. Gupta (Computers and Electronics in Agriculture, 2021)

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Common contents that the papers express are:

"Going Deeper with Convolutions" by Szegedy et al. - This paper introduced the Inception model, which uses a novel architecture that allows for deeper and wider neural networks while maintaining computational efficiency. The paper showed that this architecture achieved state-of-the-art performance on the ImageNet dataset and provided insights into how to design effective neural network architectures.

"Very Deep Convolutional Networks for Large-Scale Image Recognition" by Simonyan and Zisserman - This paper introduced the VGG model, which uses a simple and uniform architecture with a very deep stack of convolutional layers. The paper showed that this architecture achieved state-of-the-art performance on the ImageNet dataset and demonstrated the importance of depth in CNNs.

3.1 OBJECTIVE

The objective of the system mainly focuses on two things: Ease in finding the ideal crop and help farmer simplify the process of farming. The system would help farmer find nearest market place, suitable crop and other location based services which help reaching there easier. Also, weather alerts will be helpful as farmer gets sufficient time to take preventive measures. Also, farmer need not search a lot for contractors, shops, pesticides as the details will be provided in the description.

In short, system will be providing following features:

1. Secured Authentication(via OTP)
2. Plant Disease Detection
3. Crop Prediction
4. Smart Connect(to prevent the thirdparty person to take advantage of his profit)
5. Weather Info

3.2 SYSTEM OVERVIEW

Figure- 1: Level 0

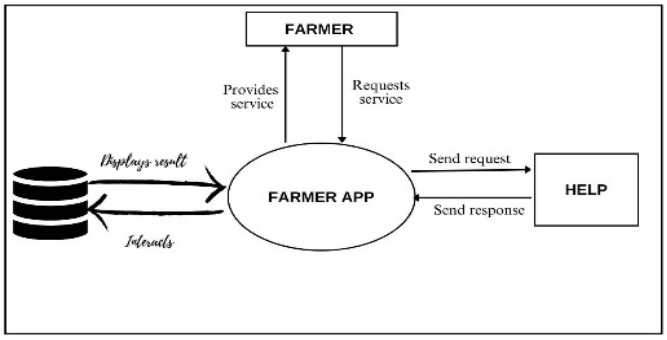
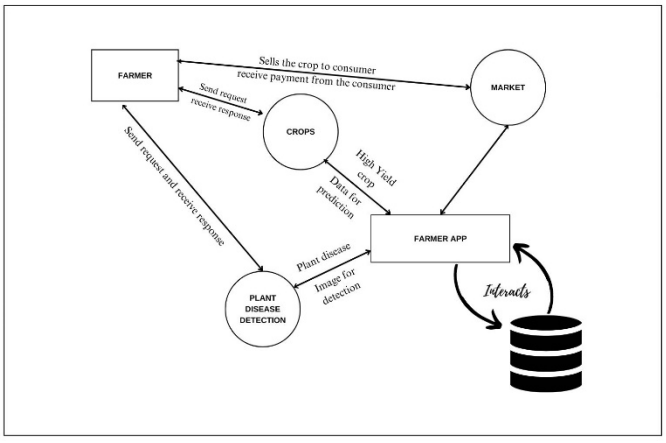


Figure-2 Level-1



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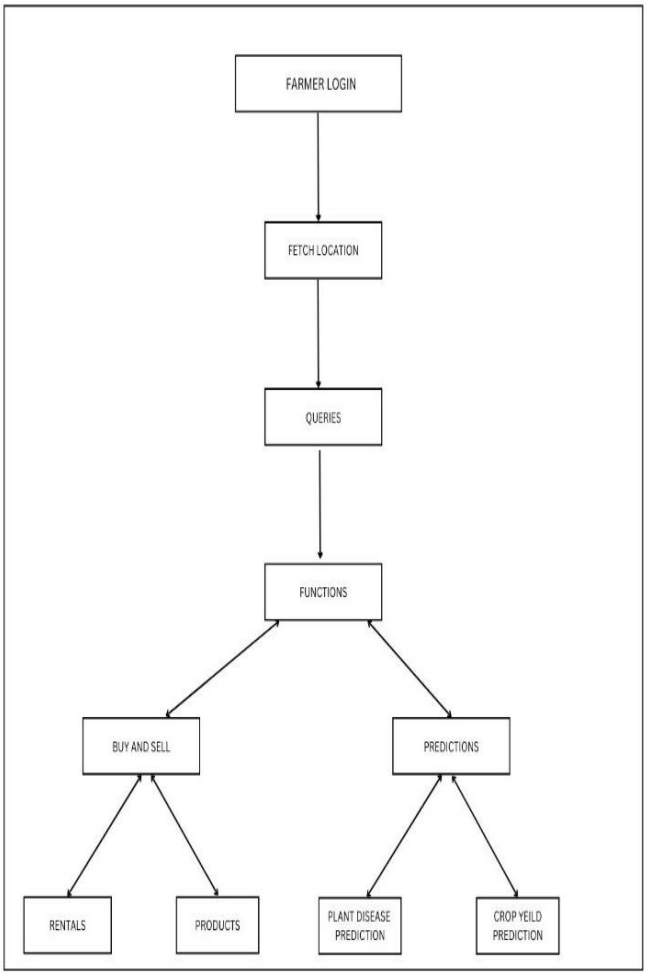
The application includes the following-

- Elegant and rich user interface using the latest material design designing method.
- Use of best possible algorithms in searching and database queries which helps user get an easy and smooth experience.
- System suggests the probable disease associated with the crop giving enough hints to farmer to take preventive measure.
- System also provides information regarding weather condition of his particular location.
- Farmer can select number of crops, market place, contractors to display within the radius. System will show the nearest possible 'n' results.
- Farmer can check the contact details of the sellers for crop seeds, marketplace.
- measures before any storm or natural calamity is occurred.
- Farmer will get the weather alerts also, so thatsufficient time is provided for taking preventive



IV. METHODOLOGY

1) Searching of nearest market-place and pesticide shops.
2) Weather updates
3) Plant diseases detection
4) Yield prediction
5) Smart connect (Selling of crops without the involvement of 3rd party person).

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V. RESULTS OBTAINED

Here are few of the results of the trained datasets.

1. Plant disease prediction:

Colab file:

https://colab.research.google.com/drive/1hgi5p1HiJeEKyEvvqjZMz2nm1BLIybCz?usp=sharing

Dataset:

https://drive.google.com/drive/folders/1yzaMTwMxC7S-Nji1WD588wD0deOr8FK8?usp=sharing

Brief explanation of the code:

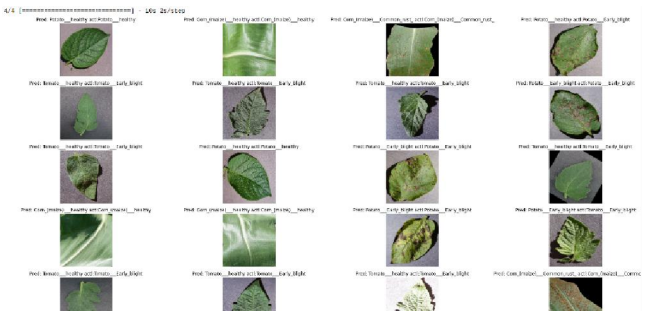
We have used convolutional neuralnetwork (CNN) model on a plant dataset and applying weight pruning to reduce the size of the model. The dataset is divided into a training set and a validation set, and the CNN model is defined using the Sequential API of Keras. The model consists of multiple convolutional layers followed by max pooling and dense layers with ReLU activation, and a softmax output layer.

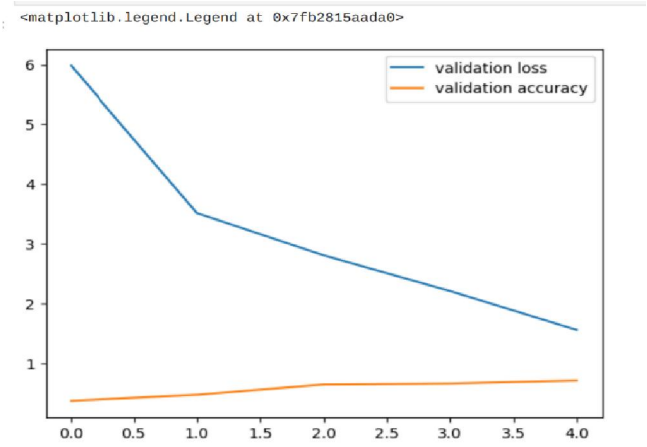
The training is performed for 5 epochs using the 'adam' optimizer and 'sparse_categorical_crossentropy' as the loss function. The validation accuracy and loss, and training accuracy and loss are plotted. After training, the accuracy of the unpruned model on the validation set is evaluated, and the model size and time taken for evaluation are recorded.

Then, weight pruning is applied to the model using the TensorFlow Model Optimization library. The pruning is performed using the 'prune_low_magnitude' function with a sparsity schedule defined by the 'PolynomialDecay' class. The pruned model is compiled and trained again for 5 epochs with the same optimizer and loss function. The accuracy and loss of the pruned model are plotted, and the accuracy of the pruned model on the validation set is evaluated. The size of the pruned model and time taken for evaluation are also recorded.

Finally, the summary of the unpruned and pruned models, including their size, time taken for evaluation, and accuracy on the validation set, are printed.

Result obtained after training of the dataset:





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2. Yield prediction-

We have used decision tree classifier to make predictions using the potassium, nitrogen and phosphors content in the soil, humidity, rainfall , temperature and soil pH.

Colab file:

https://drive.google.com/file/d/1898F6dWf-Wwd8nny0wFVbOSaAz-KFmF1/view?usp=sharing

Dataset: https://drive.google.com/file/d/18AMQf5C_O2l3XZAYxNxTqieja6zOPnSg/view?usp=sharing

In the code we used the scikit-learn library to train a decision tree classifier on the crop dataset.

A brief explanation of the code:

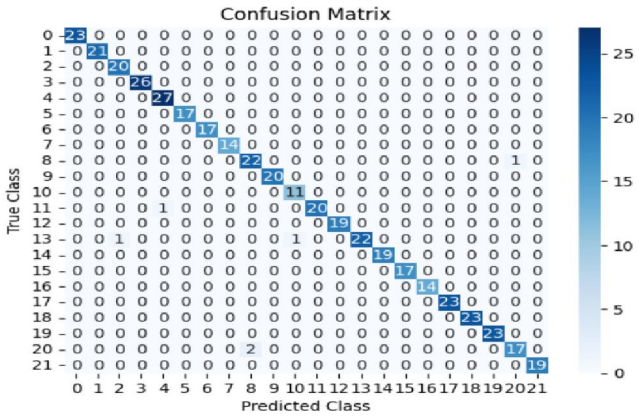
The code first imports necessary modules such as pandas for reading the dataset, DecisionTreeClassifier for building the model, train_test_split for splitting the dataset into training and testing sets, accuracy_score for evaluating the model, and joblib for saving the trained model.

Next, the code loads the crop dataset using pandas and splits the dataset into features (X) and target variable (y). Then, it splits the dataset into training and testing sets using the train_test_split function with a test size of 0.2 and a random state of 42.

The script then creates a DecisionTreeClassifier object with a random state of 42, fits the training data to the classifier using the fit method, and predicts the target variable for the testing data using the predict method.The script evaluates the accuracy of the model using the accuracy_score method, which takes the predicted target variable and the actual target variable as arguments.

Finally, the code saves the trained model as a pickle file using the joblib.dump function. The saved model can be later loaded and used for making predictions on new data.

Result graph:



VI. CONCLUSION

[1].Several literatures were reviewed accordingly and the challenges faced in the use of manual system in a village municipality. Technological developments and creativity act as tools to exchange information of agricultural activities and improve lives for farmers and the entire society [2]. The use of ICT transforms traditional agriculture to modernized agriculture [3]. World population is expected to surpass the 9 billion mark by 2050, and agricultural production will need to increase by 60 percent from its 2019/2020 levels to meet this additional food demand and ICT applications can make a significant contribution to meet this future global food needs [4] The Municipality operates a manual system where spreadsheet is used to record and process data about farm products and this leads to inaccurate and unreliable information. The e-Agriculture Management System (EAMS) will be developed to replace the existing manual system thereby resulting to increase in productivity and revenues for the farmers.

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In this manner, the system will be helping the farmer to produce crops in an efficient way by getting the updates about the weather. The farmer would get yield assistance through the application and also would help the farmer to detect the disease in the plant so that he would use the appropriate method for cure.

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