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Artificial Intelligence Driven Farmer Assistance

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ABSTRACT: Artificial Intelligence Driven Farmer Assistance is an application that focuses on assisting the farmers. The models for the application have been built using deep learning and machine learning which are subsets of artificial intelligence. The application has a wide range of functionalities which include crop disease detection along with its solution, weather forecasting for the next 12 days hour wise, check over-irrigation, locate required resources for the farmer, crop recommendation based on region, best-suited crop by taking into account various factors such as temperature, ph, and rainfall, crop price prediction for 24 different crops for the next 12 months, FAQ Chabot and farming methods. The main aim is to reach out to farmers and encourage them to use this application for their benefit.

The application of our project has primarily made use of VGG 16 neural network to train our crop state component for 38 different classes by transfer leaning, linear regression for crops to cultivate by taking into account parameters such as month and place of the farmers and Decision tree regression for crop price prediction by taking into wholesale price index of the crops as the target label. The main motto of the project is agriculture is our wisest pursuit, because it will in the end contribute most to real wealth, good morals & happiness.

KEYWORDS: Artificial intelligence, Machine learning, Deep Learning, Transfer Leaning, Linear Regression, Decision tree Regression

I. INTRODUCTION

Agriculture is the science, art, or practice of cultivating the soil, producing crops, and raising livestock and in varying degrees the preparation and marketing of the resulting products. Agriculture can help reduce poverty, raise incomes and improve food security for 80% of the world's poor, who live in rural areas and work mainly in farming. Agriculture is the key development in the rise of sedentary human civilization, whereby farming of domesticated species created food surpluses that enabled people to live in cites. Since the beginning of the 21st century, artificial intelligence has been increasingly used in agriculture .This project attempts to solve glaring problems in the agricultural world.

The project mainly built to give back to the farming committee for the hard work they put in. The functionalities in the project where identified by taking into account the current problems faced by the farmers. The farming committee in India is very large and need for invention and innovation is required for better productivity yield of their crops

Data sets collected was obtained from kaggle and trusted government sources. Datasets obtained for each component was different and was approached differently to get the best information out of it by using Deep leaning techniques. It's important to look at outliers to understand and decide if it should be included or excluded from the analysis.

The application primarily gets answers to various questions asked by farmers. The application gives various services ranging from best suited crop to crop price predicted and FAQ chat bot service to answer frequently asked questions by the farmers.

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II. RELATED WORK

An existing system which is like this project is Kisan Suvidha. The app design is neat and offers a user-friendly interface and provides information on current weather and also the forecast for the next five days, market prices of commodities/crops in the nearest town, knowledge on fertilizers, seeds, machinery etc.

The Drawbacks are:

- Due to India's geographical location, certain parts experience different climates, thus affecting each region's agricultural productivity differently.
- Farming Systems in India are strategically utilized, according to the locations where they are most suitable
- Does not have diverse visualizations.
- When it comes to crop state, every farmer sees a specialist to get the knowledge with respect to crop state.

III. OBJECTIVES

- To accomplish agricultural diversification in order to ensure availability of a wide range of commodities.
- To pre-process and extract useful features from data.
- To train a Deep Learning Model on these extracted features.
- To Classify the data-point as an Crop state.
- To evaluate model-performance and improve it.
- To perform hyper parameter tuning on components of model.

IV. PROPOSED SYSTEM

The application proposes to give a good guide to farmers related to current and future weather conditions based on the information returned by weather api. The application proposes to show an explanation of all FAQ questions asked by the farmers through a chat bot. The application proposes to identify crop state and give information about its state (healthy/not healthy) along with its solution if it is diseased. The main aim is to reach out to farmers and encourage them to use this application for their benefit.

V. PROJECT MODULES

A. *Crop Price Prediction Module*

The module makes use of decision tree regression algorithm to predict the value of a particular crop for the upcoming months taking into account the historical data of the particular crop which includes rainfall, temperature and pH values.

B. *Resource Locator Module*

This module takes into account the person's current location or any other manually entered area and uses Google geolocation API, thereby the module will output the location of the nearest resource repository entered in the search clause.

C. *Weather Information Module*

This module destructurises the contents of the Microsoft Azure weather API and gives the value of the current and future weather conditions.

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D. *Crops to cultivate Module*

This module makes use of decision tree regression by taking into account the person's current location, season, weather and soil information of which crop can be recommended to be grown

E. *Check Irrigation Module*

The Component helps users to irrigate farmer's crops or not, thereby checking over irrigation. Module makes use of a formula to calculate how much to irrigate.

F. *Crop Health Information Module*

The module returns the crop image uploaded by the user is healthy or not, if not healthy gives information of what disease is associated to it and how to overcome it. Makes use of Transfer learning algorithm.

G. *Upload Image Module*

This component allows users to upload new images and details of crops, which are uploaded to firebase firestore.

H. *FAQ Chatbot Module*

The chatbot module has been implemented to help be interactive with the users of the app and provide a virtual assistant, to help the users query for frequently asked and general questions relating to the agricultural industry. The chatbot has been hosted using Microsoft Azure's bot services. Component has mapped the Questions to the Answers and uses AI to predict new questions.

I. *Farming Methods Module*

Farming methods, gives us a template of the various farming methods that can be employed. This module gives a brief overview of the preferable farming techniques that are used currently. The component also provides information and benefits of the particular farming method also giving further information via Wikipedia link attached to each farming methods.

J. *Best Suited Crop Module*

The module makes use of decision tree regression. The input given to the model consists of air temperature, air humidity, pH and rainfall values. The output of the model is the best suited crop based on the crop probability factor.

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VI. SYSTEM ARCHITECTURE

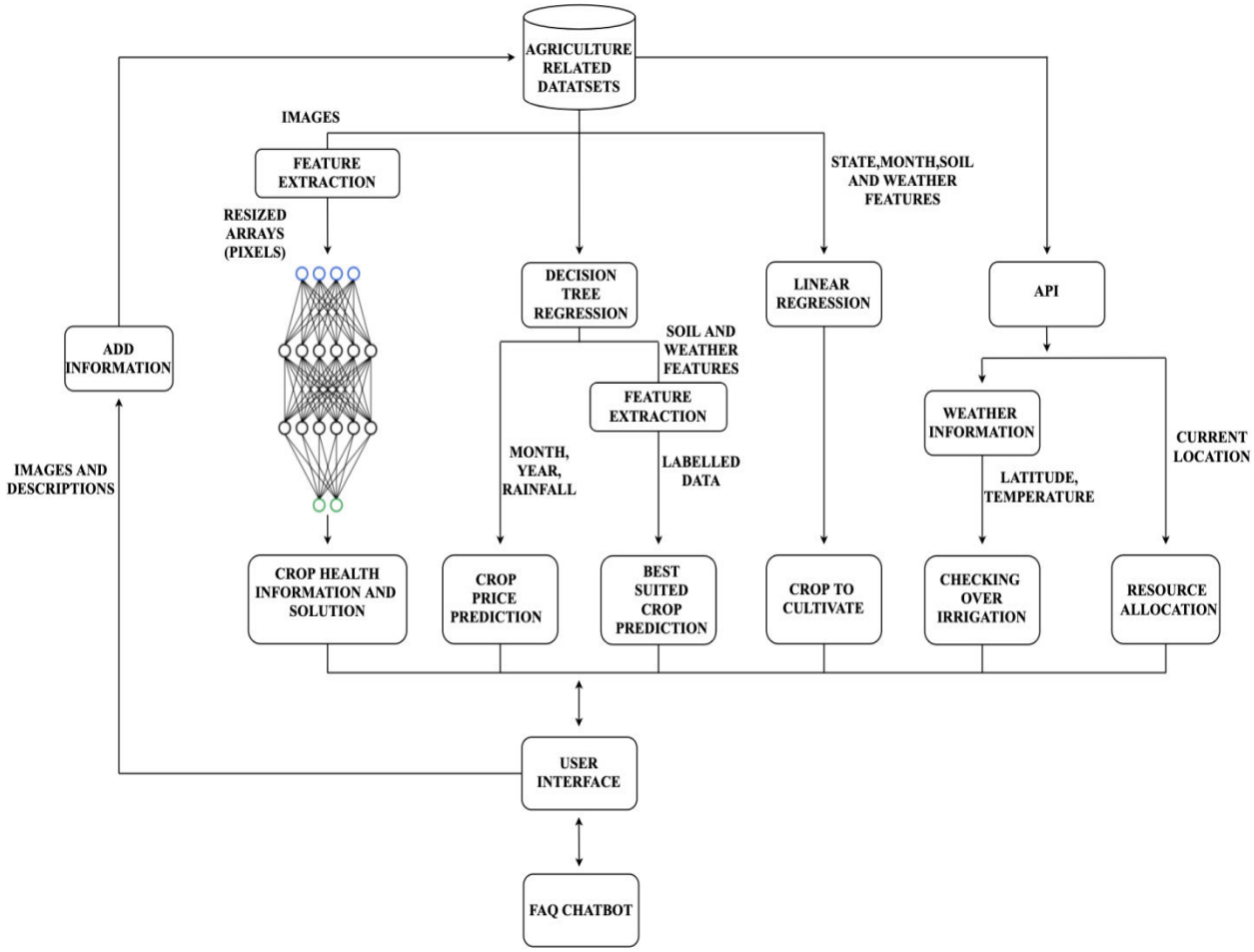

Figure-1 System Architecture Diagram

The Figure-1 diagram shows system architecture diagram of the application. The system architecture consists of user interface to which new information can be added by the farmers to the agriculture dataset. The added information can be useful to widen our dataset. In the crop health component the images are cropped to 224x224 and given to VGG16 which makes use of transfer learning to train faster. Total of 38 classes are classified in this component along with solution if the crop is diseasesed. Crop price prediction component makes use of month, year and rainfall to predict the whole sale price index of the crop. Best suited crop component makes use of soil ph, temperature, rainfall to predict the best suited crop for the location. Crops to cultivate component makes use of state, month, soil and weather information to get the crops to cultivate in the given area. Weather component fetches 12 days of hour wise information and displays it on the user interface. Resource allocation gives the nearest location of the resource the farmer is looking for. Chat bot answers all the frequently asked questions asked by the farmers.

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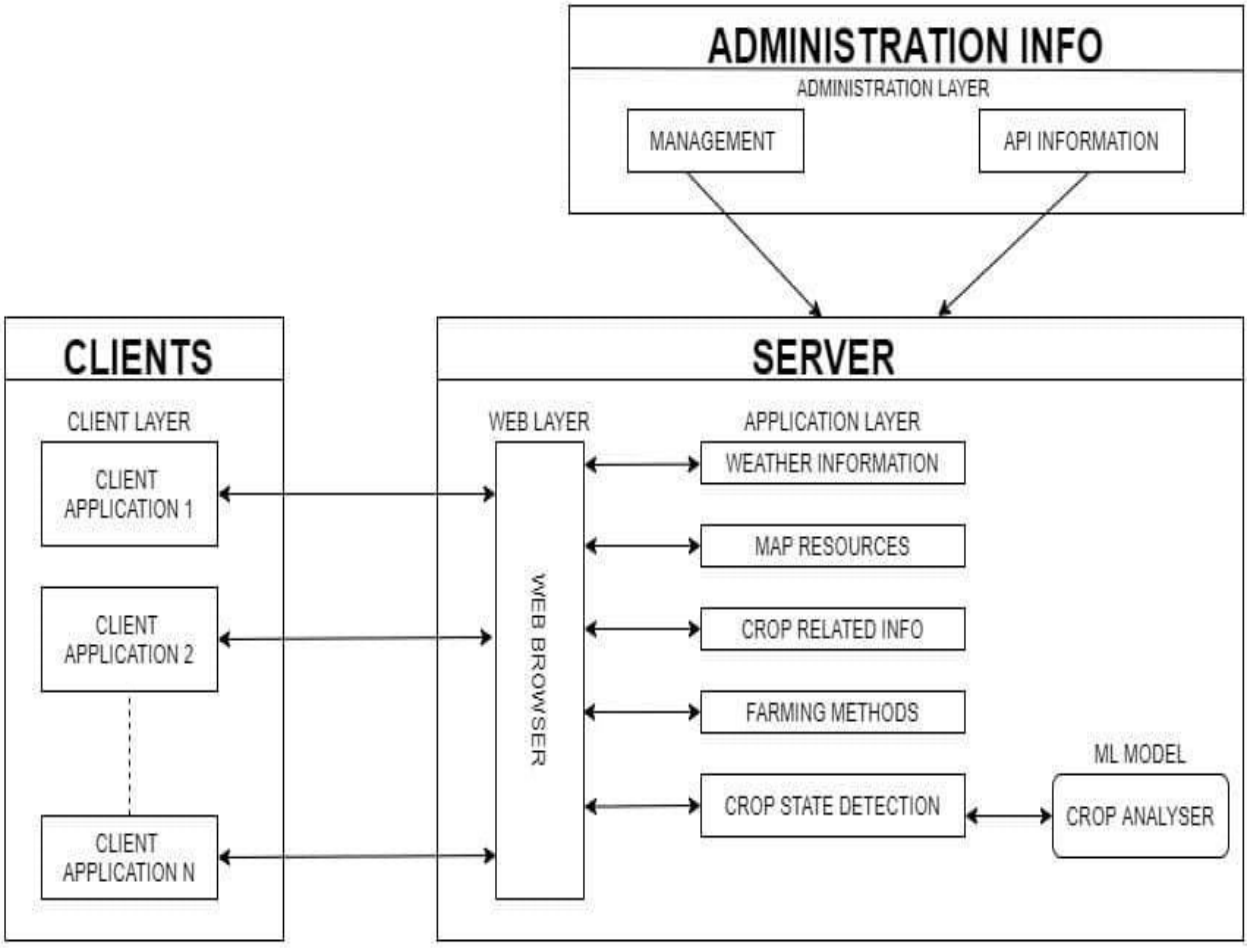

Figure-2 Data flow Architecture

The Figure-2 shows flow of data internally within the server and external system which consists of clients and administrator section to look after performance of the server. The figure depicts multiple clients accessing the services of the server .The clients by means of web server accesses the components. Weather information gives the next 12 days of weather hourly wise. Mapping resource gives the nearest resource location based on the query entered by the farmer. Crop related information includes components such as crop price prediction and check irrigation component. Farming method is a static website which shows various farming techniques that can be adopted by the farmers Crop state selection makes use of model trained to make classification of type of disease or if it is healthy.

VII. ALGORITHM

Algorithm 1: Crop recommendation based on city and month using linear regression

- **Input**: Month, name of the state, ph, rainfall and.
- **Output**: Multiple crops recommended.

Step 1: Analyzing the correlation and directionality of the data , which included rainfall, temperature and pH values for state and month(All the attributes where found influential for the crops to be cultivated)

Step 2: Estimating the model(fitting the line), splitting of data was done 9:1

Step 3: Evaluating the validity and usefulness of the model, the model evaluated had an average of 78.9% testing

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Algorithm: Decision Tree Regression to decide crop price and crop recommendation.

- **Input**: pH, temperature, rainfall and Wholesale price Index in crop price prediction and air temperature, air humidity, pH and rain for crop recommendation.
- **Output**: Price of the crop and recommended crop to be grown based on current location.

  Step 1: The standard deviation of the target(Whole sale Price Index in our case) is calculated.

  Step 2: The dataset is then split on the different attributes and the standard deviation for each branch is calculated, the resulting standard deviation is subtracted from the standard deviation before the split and this result is the standard deviation reduction.

  Step 3: The attribute with the largest standard deviation reduction is chosen for the decision node.

  Step 4: The dataset is divided based on the values of the selected attribute. This process is run recursively on the non-leaf branches, until all data is processed.

Algorithm: Crop Classifier using Discriminability-based transfer

- **Input**: A dataset consisting of number of images of crops specifying the disease associated with it.
- **Output**: Classifying the state of the crop and specifies the solution for the current state of crop inputted if not healthy.

  Step 1: 77000 images taken and divided to test and training in a manner where label of the images were named after folder

  Step 2: The train dataset is given to vgg16 along with the custom layers

  Step 3: Test and validation of the model

VIII. PSEUDO CODE

Pseudo code for Crop Health Information

```
Begin
    CropHealth(testing image)
    1. model = torch.load('my_model_25.pth')
    2. Predicted class number = model.forward(testing image)
    3. class name = Dictionary[ Predicted class number ]
    4. return class name
End
```

Pseudo code for Crops to Cultivate

```
Begin
    CropCultivate(state,month)
    1. Initialise X,Y= data['Rainfall','Temperature','pH'],data['crops']
    2. model = LinearRegression().fit(X, Y)
    3. Initialise Rainfall = getRainfall(state,month)
    4. Initialise Temperature = getTemperature(state,month)
    5. Initialise pH = getpH(state,month)
```

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6. crop names = model.predict([Rainfall,Temperature,pH])

7. return crop names

End

Pseudo code for Best Suited Crop

Begin

bestSuitedCrop(airTemperature,airHumidity, pH,rain)

1. Initialize X = dataset[:4]

2. Initialize Y = dataset[-1]

3. model = DecisionTreeRegressor().fit(X, Y)

4.cropname=model.predict([airTemperature,airHumidity, pH,rain])

5. return crop name

End

- **Results**

- Farmers can get information on the crop disease and its solution if it is not healthy.
- The application helps the farmers in navigating to the closest store where the required resources are available
- The system gives us valuable suggestions about which crop is best suited for the given region for a particular season.
- The farmers can get insights on how much water is required to irrigate a crop.

IX. CONCLUSION, APPLICATIONS AND FUTURE WORK

A.*Conclusion*

The proposed system attempts to reduce the distress of farmers and thereby increasing their profits. India is heavily dependent on the agricultural productivity. The proposed system gives answers FAQ asked by the farmer.

B.*Applications*

- To understand various crop states that can be achieved for different variates of plants.
- To understand how much to irrigate a particular plant based on its lifecycle and season.
- The predictions give a before-hand idea of the trend of the spread of the corona virus, thus giving ample time to prepare for any untoward situations.
- To understand and educates the farmers about the modern farming techniques used under different weather conditions.
- The different visualizations of the predictions give us a demographic and semantic view of the results, helping us to understand it better.

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C.*Future Scope of the Project*

- In the future, aim is to expand this project in the field of IoT to get real time results from the farmer's farm.
- Develop iOS and Android Clients for Mobile Access
- Further tune the model for better performance

REFERENCES

[1]Heechang chung;Dongil kim;Soonghee lee;Sokpal Cho, "Smart Farming Education Service based on ulearning environment" 2019 21st International Conference on Advanced Communication Technology (ICACT) Year: 2019 | Conference Paper | Publisher: IEEE

[2] Vikky Aprelia Windarni;Eko Sediyono;Adi Setiawan, "Using GPS and Google maps for mapping digital land certificates" 2016 International Conference on Informatics and Computing (ICIC) Year: 2016 | Conference Paper | Publisher: IEEE Cited by: Papers (1)

[3] G. Omkar;S. Vasantha Kumar, " Time series decomposition model for traffic flow forecasting in urban midblock sections" 2017 International Conference On Smart Technologies For Smart Nation (SmartTechCon) Year: 2017 | Conference Paper | Publisher: IEEE Cited by: Papers (1)

[4] Kumar Abhisheka , M.P.Singha , Saswata Ghoshb , Abhishek Anandc, "Weather forecasting model using Artificial Neural Network" ,Dept of CSE, NIT Patna -800005,India on b Mphasis an HP Company, Mangalore -575001,India c Accenture , Bangalore ,India.

[5] Cao Lianhai,Li Zhiping,Chen Nanxiang," Optimal Allocation of Multi-objective Water Resources Based on Genetic Algorithm" 2010 Third International Conference on Information and ComputingYear: 2010 |Conference Paper | Publisher: IEEE

[6] Tian Shou-gang,Fan Ming-yuan 2011 International Symposium on Water Resource and Environmental Protection , "Research on Coordinated Evaluation of District water resources allocation" Year:2011| Conference Paper | Publisher: IEEE

[7] N. Abroyan, "Convolutional and recurrent neural networks for real-time data classification," 2017 Seventh International Conference on Innovative Computing Technology (INTECH),Luton, 2017, pp. 42-45, doi: 10.1109/INTECH.2017.8102422.

[8] Y. Cherdo, P. d. Kerret and R. Pawlak, "Training LSTM for Unsupervised Anomaly Detection Without A Priori Knowledge," ICASSP 2020 - 2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP),Barcelona, Spain, 2020, pp. 4297-4301, doi: 10.1109/ICASSP40776.2020.9053744.

[9] S. Parsai and S. Mahajan, "Anomaly Detection Using Long Short-Term Memory," 2020 International Conference on Electronics and Sustainable Communication Systems (ICESC), Coimbatore, India, 2020, pp. 333-337, doi: 10.1109/ICESC48915.2020.9155897.

[10] Sushmitha Kothapalli;S. G. Totad, "A real-time weather forecasting and analysis" 2017 IEEE International conference on Power, Control, Signals and Instrumentation Engineering (ICPCSI) Year: 2017 | Conference Paper | Publisher: IEEE Cited by: Papers (1)

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