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IoT Based Smart Farm Agriculture System for Farmers

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Abstract: In 2050, the global population is estimated to be about 9.7 billion, as a result of which there will be great food demand. In order to meet these needs, it is necessary to increase the existing system of agriculture. It's fine, according to the traditional way of agriculture, but still it won't meet the world's entire requirements. Here applications of data mining techniques in estimation of yields and climate change are called to help the farmer make decisions for farming and gain the required economic return. A significant issue that can be beaten dependent on past experience is the issue of yield estimation. In this manner, a brief study of harvest yield forecast is proposed utilizing CNN system. Using Google API to access crop production patterns in response to climatic conditions such as rainfall, temperature, relative humidity, evaporation and sunshine etc. Crop prediction is a pre-condition, and prediction of disease is a post-condition for the collection of data from a field or area from a weather parameter sample. It lets farmers improve quality in decision making. And using this proposed system farmer can able to suitable crop with high yields.

Keywords— CNN algorithm, Smart Agriculture, Weather climate data, ,IoT in agriculture.

INTRODUCTION

India is an agricultural country and depends on farming for about 70 percent of the population. Different elements have influenced the soundness of farming in India. Farming is depends on weather condition like temperature, rainfall, humidity , soil type with respect to farming land. It consider to be cultivation of plants their needed fertilizers, harvesting etc. Among in the all procedure, in mean time its go throw plant disease problem. Plant disease contributes to a significant reduction in both agricultural service quality and quantity. To enhance on this problem Smart Agriculture system is to be design. The smart farm is a kind of farm automation system based on IoT technology. In this proposed system design CNN algorithm to be used for leaf disease control. Detection of plant disease using CNN will be evaluate as well as its recommend to farmers fertilizers/pesticides. The existing framework comprises utilization of SVM arrangement, KNN classifier for to accomplish great agribusiness item. It just identify the influenced leaf is exceptionally wasteful and lessen exactness of picture characterization. To defeat on this existing issue in agriculture framework new proposed system is designed. In this proposed system CNN algorithm is utilized for defected leaf preparing which utilized for to recognize disease and reasonable manures to diminish plant ailments. Crop quality is depends on climatic boundaries (soil, water, precipitation, manures, water system). Weather climate is utilized in this planned framework. It includes weather condition like temperature, humidity, rainfall type regarding cultivating land. Initial step is to enrollment of users(farmers). Proposed system consists two module as Pre-condition and Post-condition to access condition for development of plant. First Pre-condition module worried about harvest forecast utilizing using weather climate data. And second is Post-Condition module worried about forecast of leaf disease utilizing CNN algorithm calculation. Climate data THR(Temperature, Humidity, Rainfall) through Google API is to be utilized. The examination of climate data is anything but difficult to expand quality and amount of yield item. Image processing utilizing Convolution neural system (CNN) is utilized for the discovery of plant infection. CNN method is utilized for plausible plant infection control. Illness comprises side effects are seen on the leaves, stem and organic product. To overcome on this issue CNN is planned as a proposed framework. As well as it suggests farmer for precise fertilizers with their nearest shops.

Problem Statement

To design a system which will suggest farmer suitable crop according to environment and recommend fertilizers for probable disease control.

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LITERATURE SURVEY

The most significant factor for plant development is soil moisture is clarified in this way utilizing agriculture IoT frameworks. Soil humidity sensor is designed for this system. Because wet underground soil moisture sensors are mounted, and the sensor consists of copper, rust eats away the sensor copper coating. Based on agricultural IoT Environments, soil humidity details can be obtained from rusting of sensors on a smart farm system. Makes for a successful smart crop. Here a new type of soil moisture sensor to increase the lifetime [1].

In this system Internet of Things and Data Analytics is used as a smart agriculture to improve working efficiency and productivity in the agricultural sector. The IoT incorporates many existing technologies, as applications for WSN, radio frequency recognition, cloud computing, and end users. Use of wireless sensor network (WSN) to use IoT and DA as a major view of smart agriculture. IoT has identified many opportunities and threats. Using the IoT concept with ecosystem and combining IoT and DA makes smart farming possible. It provides future business trends and opportunities, and marketability of products [2].

To meet the demand for food, problems such as extreme weather conditions continuously and increasing climate change will be resolved. Smart IoT- based farming would allow farmers to decrease waste and increase productivity from the amount of fertilizer used. So, smart farming is a capital- intensive, high-tech system for masses to grow food cleanly and sustainably. It introduce concept of modern ICT (Information and Communication Technologies) in farming. Here the IoT hardware and software for smart farming is introduced, in addition to sharing the successful results [3].

IoT computer is a built-in network with sensors which needs wireless connectivity [4]. The embedded system consists of field programmable gate arrays or microprocessor, interfaces for connectivity, memory and input / output. The downside is that Standard wireless communication definition is used. Within 100 m, the short range standards will span distances. The long-range levels of contact will reach distances of up to 10 s / km [4].

Traditional crop yield prediction approaches based on remote sensing contributing different classical Machine Learning methods such as Support Vector Machines and Decision Trees. Convolutional Neural Network (CNN] and Long- Short Term Memory Network (LSTM] are deep neural network models that are proposed for crop yield prediction recently. This study focused on soybean yield prediction of Lauderdale County, Alabama, USA using 3D CNN model that leverages the spatiotemporal features [5].

The use of advance technology such as Internet of Things, Sensors, Cloud Computing, Mobile Computing, Big storage Analysis in Agriculture. The properties of soil and atmosphere are observed and continuously transmitted through IoT to Agro Cloud. Big data processing on Agro Cloud technology is performed for the requirements of fertilizers, best crop sequence processing, overall growth, and existing requirements for stock and demand. Increased agricultural production and cost management of agro-products are useful for this. The machine does not have specific sensors of soil nutrients and fails to generate correct results [6].

In this paper image processing using MATLAB is used to come at weed areas in an image. To over come on the problem as increasing population and their food requirements. Its need to implements good product with respect to their food quality concept is implemented. The green revolution concept is used to implement natural methods. In this paper no. of references are used to designed proposed system. [7]

The plant disease and defense mechanism against the disease is used in this system. Here using the help of internet database was maintained. In this proposed database various plant diseases data was stored which consists of the accuracy and level of the project. The new concept Convolution Neural Network(CNN) was used of plant disease prediction As well as drone model was designed. Drone is used to access images of plants. Using CNN algorithm accuracy level was achieved of 78%. This system is used python to design this system.[8]

To order to improve agriculture product, quality, quantity its needs to manage good management in modern agriculture sector. In this paper use of big data is derived to monitoring system. New application of agriculture is designed that is cloud computing as well as Internet of Things. In this proposed system different types of database is designed. Growth in Modern agriculture is based on IoT is implemented [9].

PROPOSED METHODOLOGY

The proposed system developed as per the recommendation of crop as per area, suggestion crop with cultivation process prediction of crop disease and its process as well as fertilizers and prediction and this system also recommends the nearby fertilizer shop.

The proposed technique involves the following steps:

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CASE 1: Pre-condition
Step 1 : Registration/login of farmer.
Step 2 : Crop yield and disease prediction as per area and crop.
Step 3 : Predict THR.
Step 4 : Recommend precision/fertilizer.
Step 5: Shop recommendation as per area.
Step 6 : Notification given by farmer.

In this designed system first it capture the leaf images using image processing and identifies the disease. Depend on disease system will recommend pesticides. Depend on soil type system will also provide appropriate crop cultivation. Following steps are used to identify the disease of plant in which segmentation feature extraction classifiers plays an eventful role.

CASE 2 : Post-condition
Step1: Input the image.
Step2: Preprocessing of the image which reduces the noisy data from it.
Step3: Image segmentation is performed which divides the image into the small segments.
Step4: Extract the features from the segments of the image.
Step5: Selects the optimized features by optimization process using Deep learning method.

Step6: Features learned by the classifier
Step7: Detect the affected leaf
Step8: Analysis of Accuracy, Precision, and recall.
Step 9: Recommend precision/fertilizer.

Advantages

1. It will capture the image and identify the disease.
2. Recommend the pesticide for the disease.
3. Real time working model.

Enhancement in Existing System
The existing system only detect the affected leaf to enhance the existing system the proposed system design CNN algorithm for prediction of diseases and recommend the pesticides for that disease to avoid the diseases .

A. System Architecture:

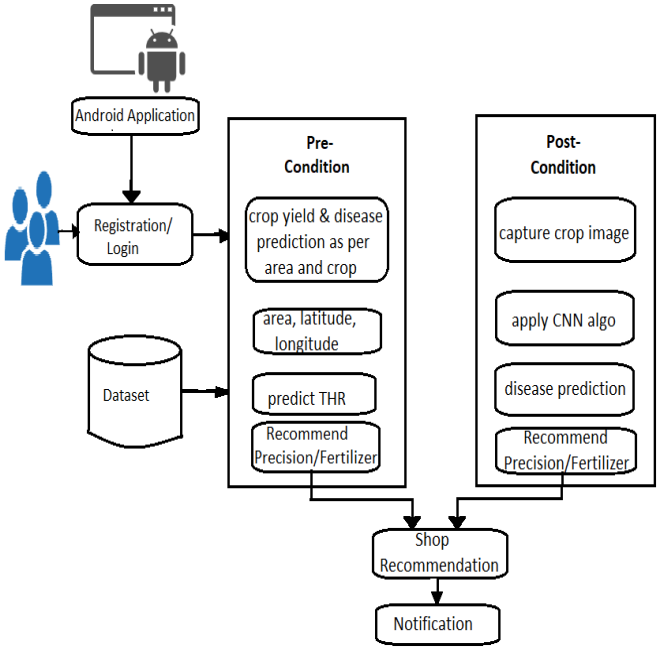

Fig.1: Proposed System Architecture

Following are the algorithms that are used in the proposed work. The Grey wolf optimizations are used to optimize the features which are given by CNN.

CNN Algorithm:
The convolutional neural networks (CNNs) has accomplish an fourceful results in the region of image distribution. CNN algorithm approach to be used in the progress of plant defect(disease) identification example. It consist different plant leafs from their surroundings. For CNN other structures are included as follows:

1. *Convolution Layer:* Convolution is the first layer where features are derived from an input image. Convolution maintains the relation between pixels by using small squares of input data to learn image features.

2. *Strides:* Stride is the number of pixels transferred over the vector of the data. When the stage is 1 we transfer the filters at a time to 1 pixel. If the step is 2 move the filters at the same time to 2 pixels and so on.

3. *Padding:* Sometimes filter doesn't fit the input image perfectly. It have two options: Patch the picture with zeros (zero- padding) to blend in. Fall the image section where the filter failed to match.

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4. *Pooling: Layer* Part of pooling layers will lower the number of parameters when the images are too large.

RESULT AND DISCUSSIONS

Accurate forecasts of these climatic parameters would result in accurate production forecasts in the future. Hence this model will be strong supportive tool for the farmers in making best decisions for cultivation well in advance in order to achieve maximum crop. The goals of system are:

- Simplified and reduced the manual work.
- Big volumes of data can be stored.
- It provides Smooth workflow.

Database is followed as per given table.

r. No.	Crop Name	Disease	Fertilizer
1	Wheat	Leaf rust	Strobilurin
2	Potato	Early blight	Bonide Liquid Copper Fungicide
3	Tomoto	Early blight	Mancozeb
4	Tomato	Septoria leafspot	Daconil

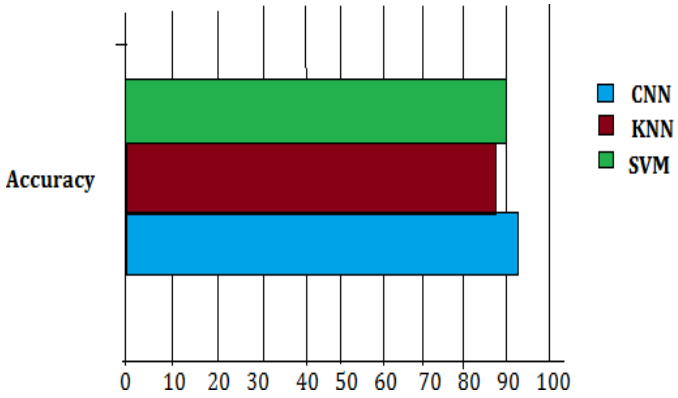
Database is stored on cloud. In this proposed system some types of crop include and related disease with their precise fertilizer is suggested. So it is helpful for farmer to take crop with respect to climate as well as their is suitable provision of fertilizer suggested. Above dataset

table shows three crop set(wheat, potato, tomato) with their disease and solution of fertilizer. Like this way other crop dataset (grape, paper bell , maize) is also stored. This dataset is used at the time of training. It shows precise result.

PROPOSED RESULT

Comparison of algorithms are shown in table 1

Sr. No.	Algorithm	Accuracy
1	CNN	92
2	KNN	89
3	SNM	90



The model is trained using CNN, KNN, SVM algorithm output result is notice that the training time for SVM and KNN algorithm is required less where the CNN algorithm time require for training is more compare to SVM and KNN but accuracy and precision of CNN algorithm is high compare with SVM and KNN.

CONCLUSIONS AND FUTURE WORK

The soil sort and the storm assume an important job of predicting the yields are to be planted in the cultivable land to bring knowledge to the new farmers. The right use of pesticides and fungicides to be known for executing ailments and bugs. It is hypothesized that using CNN algorithm strategies would produce acceptable disease results, and suggest accuracy / fertilizer. The farmer will be made aware of the agricultural circumstances. In this task, another strategy was proposed here for the expectation of harvest ailment and yield from momentum climate using Google API with the help of calculating CNN and estimating yield diseases from yield protest and discovering climate forecast. Grouping based on CNN and Density shall be added to the dataset.

- Plan to further study and improve the data set for all types of crops with their diseases in future work. Also in future it can work on IoT sensors.

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