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AGRI-HUB SMART AGRICULTURE MARKETING USING MACHINE LEARNING AND CLOUD

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Abstract: In most developing countries like India to go in to a developed stage agriculture has to play a significant role in the nation's economic progress. Hence increasing agricultural productivity and eliminating unwanted middlemen is important in order to reduce poverty and bring lakhs of farmers in a well to do state. The main challenge in building a developed farming sector is to improve the efficiency of an agricultural supply chain. As mobile and internet has become an integral part of our day-to-day life, thus making effective use of it can be made to connect people and share information. Another issue of supply chain is the quality of the farm product. Today people are becoming aware of the food safety issues and health conscience which are linked with the increased chemical pesticides in the fruits or vegetables they purchase. Organic products have become a viable alternative for most people as they believe in the quality of the food product. Due to the high and steady growth in need of organic farming, many fake products have also entered the market and the consumers are ready to pay a premium price for it which generates a loss for the consumers. There is no assurance about the authenticity of the product being organic and hence consumers are losing their confidence and money in such products. To overcome this challenge, an end-to-end supply chain system is presented factored in with the help of machine learning algorithms which not only help in promising a fair price to farmers for their produce before sowing but also provide customers with satisfaction and guarantee to get an organic product and not a mix one. Thus, our system will be a Direct Farm to Consumer (DFC) application which will become a smart Agri Hub to sell and purchase products. We are going to integrate mobile computing, cloud computing and machine learning together to create a DFC application which will manage the demand and sale ratio. We are using a training dataset of our own which will help in increasing accuracy of our application. We are going to use SVM algorithm for machine learning.

Index Terms - Mobile Computing, Cloud Computing, Machine Learning, Support Vector Machine (SVM), Direct Farm to Consumer (DFC), Advanced Encryption Standard (AES), etc

I. INTRODUCTION

In The organic food industry has been around for a while. People are getting more aware of what they are eating and are willing to pay more for organically grown farm products. The online ordering of organic products has recently caught the trend. There are several small players emerging in the market who deal with delivering organic products online. However, each one of them has its own limitations. This limitation has to be handled to increase the consumer confidence in organic products. If this confidence is not increased there will not be demand for organic products and the farmer pursuing it will be in loss. So a application can be designed which will handle demand and sale of organic farm products.

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The main motivation of this paper is to:

- To give farm produce price to the farmers.
- To give good quality farm products by giving importance to organic farming.
- Apply technology in farm produce and sale thus improving the life of the vast farming community in the country.
- Analyze the data generated during produce and sale of farm products.
- To help farmers and customers experience the technological advances i.e., farmer will earn more money and a fixed sale option and a customer can get a guaranteed quality product.

The process of what exactly happened in farmer and customer is demonstrated in the Fig.1.

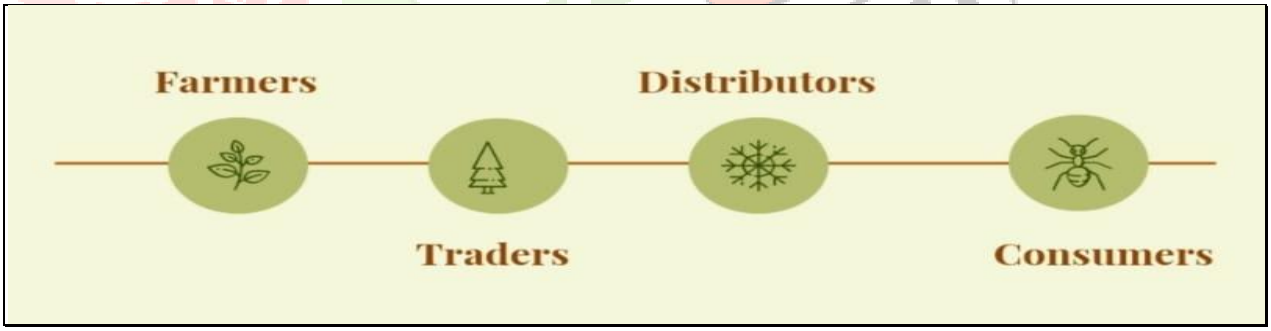

Fig.1: Existing System

Thus, the rest of the paper is structured as follows:

- Section II. Explains literature survey which studies various techniques with their advantages and drawbacks.
- Section III. Explains the methodology i.e., mathematical model to be used by the system.
- Section IV. Explains proposed system with block diagram or system architecture and working of the system.
- Section V. Shows the results of how the application is implemented and how they can be used.

II. LITRATURE SURVEY

In This section describes the fundamentals of various cloud computing and machine learning techniques that can be used in designing a new more reliable and secured Agri-Hub system for supply and demand management in an agricultural perspective. It helps in understanding various ideas put forward by various technical papers published by various authors and how they put forth a more accurate and concrete techniques. It helps in understanding various ideas put forward by various technical papers published by various authors and how they put forth a more accurate and secured techniques. Some of the ideas with technique and drawbacks are mentioned below:

1. Paper: - Predictive Agricultural Demand Insights uses Machine Learning.

   Year: - 2020.

   Author: - Ruchi Sharma, Riya Kapoor, Nisarg Bhalavat and Chintan Oza.

   Technique: - Predictive Agricultural Demand using apriori algorithm.

   Drawback: - This paper presents a valid approach for analyzing demand and sale for Agri-Hub but does not detail how to secure the data on the cloud. It also does not illustrate the use of machine learning and cloud together.

2. Paper: - E-GOVERNANCE IN AGRICULTURE.

   Year: - 2020.

   Author: - Krithika L.B, B.Prabadevi, Sai Brahma Nikhlesh.V, Asha Jerlin M, and Nithya S.

   Technique: - Agricultural production and sale using cloud technology.

   Drawback: - This paper presents a valid approach for analyzing demand and sale for Agri-Hub but does not detail how to secure the data on the cloud and how to improve it using machine learning. It also does not illustrate the use of machine learning and cloud together

3. Paper: - A Three-Layer Privacy Preserving Cloud Storage Scheme Based on Computational Intelligence in Fog Computing.

   Year: - 2018.

   Author: - Tian Wang , Jiyuan Zhou, Xinlei Chen , Guojun Wang , Anfeng Liu , and Yang Liu.

   Technique: - Data security using cloud computing and Fog Computing layer.

   Drawback: - This paper presents a valid approach for analyzing demand and sale for Agri-Hub but does not detail how use machine learning with the current framework that it has proposed in their work.

III. METHODOLOGY

This section will study the mathematical conditions to be used for designing a mobile application using cloud. These are explained as follows:

A. Mathematical Model:

A.1. Set Theory Applied to the Project

1. Farmer: -

Set(F)={F0, F1, F2, F3, F4, F5}

F0 ∈ F = Register using mobile.

F1 ∈ F = Enter product info.

F2 ∈ F = Handle product info.

F3 ∈ F = View orders.

F4 ∈ F = Dispatch orders.

F5 ∈ F = View product insights from admin

2. Consumer: - Set(C)={F0, C0 ,C1, C2, C3, F5}

F0 ∈ C = Register using mobile.

C0 ∈ C = View product info.

C1 ∈ C = Select products for purchase.

C2 ∈ C = Place order.

C3 ∈ C = View Acknowledgement.

F5 ∈ C = View product insights from admin.

B. Probability, NP-Hard and NP-Complete

So, by studying the sets as defined above we come to notice that elements F0, F5 are common in both modules and used in coordination in both sets which can be placed as

$$x \in F \cap C \text{ i f } x \in F \text{ and } x \in C$$

Thus, the probability of intersection of elements in both modules can be given as

$$P(F \cap C) = P(F) + P(C)$$

So, intersection of common elements can be shown as

$$F \cap C = \{F0, F5\}$$

The conditional probability of both modules using the same elements can be shown as

$$P(F|C) = \frac{P(F \cap C)}{P(C)}$$

Thus, we conclude that our project “Agri-Hub Smart Agriculture Marketing Using Machine Learning and Cloud.” success and failure will depend upon the internet as our product data is stored on cloud, i.e., if the internet connection is not good or not present the product data will not be fetched and the project won’t work, thus this is a case of failure, so our project supports NP-Hard and not NP-Complete.

IV. PROPOSED SYSTEM

This section is mainly divided in 3 main modules with other sub parts in them. The text that follows explains the modules with block diagram or system architecture as shown in Fig.2. to illustrate them. The working of the framework is explained as:

- **Support Vector Machine (SVM):-**

  In this module we first propose to fetch the dataset from google cloud. The extracted feature keywords will be used to create a training dataset which will train SVM. Then a testing data will be passed from which a testing dataset will be created. Both training and testing datasets will be passed to SVM algorithm which will give a classification results in the form of two classes i.e., good and bad SVM:

- **Advanced Encryption Standard (AES) -**

  This algorithm will be used to secure the application data stored on Google cloud. 128-bit AES algorithm will be used. It can be explained as, 128 bit AES algorithm will be used. The Advanced Encryption Standard (AES), also known by its original name Rijndael, is a specification for the encryption of electronic data established by the U.S. National Institute of Standards and Technology (NIST) in 2001. The algorithm described by AES is a symmetric-key algorithm, meaning the same key is used for both encrypting and decrypting the data.

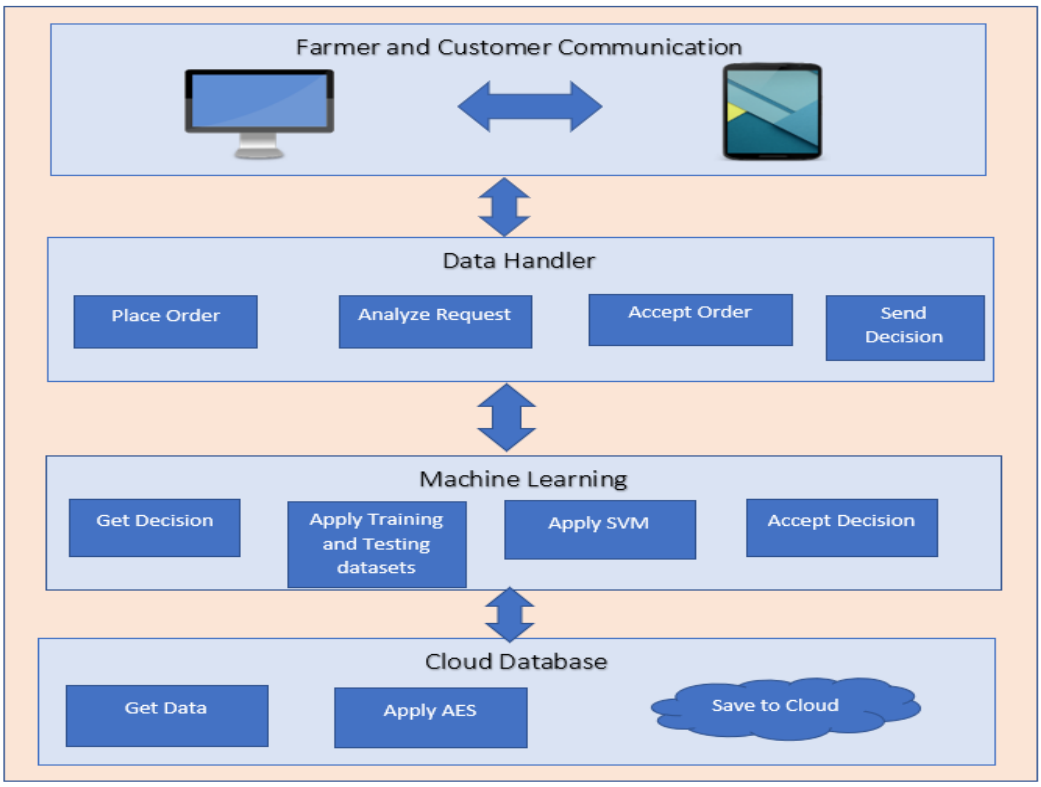

Fig.2: System Architecture Diagram

There modules in the project can be explained as:

1. **Farmer Module :-**

   This module is a mobile application. In this module a farmer will register first. Then he will login using the credentials and view menu. From menu first he will enter the farm products he intends to sale. Then he will update product details with how much qty and what rate he intends to sell his farm products. Then he will view the orders received and reply the dispatch status of the products.

2. **Customer Module:-**

   This module is a mobile application. In this module a customer will register first. Then he will login using the credentials and view menu. From menu first he will view the farm products for sale. Then he will open the

purchase and purchase products from the list and send the order. From the menu he can view the dispatch status of his ordered products.

3. **Admin Module:-**

This module is a desktop application. In this module an admin will view prod ucts, customers and farmers in a table view. The admin will then create a training dataset using the qty, rate and amount as parameters. The training dataset will be used to train the SVM algorithm. The admin will retrieve the product sale details and them to training dataset for analysis. Then he will train and apply SVM algorithm and get the classification in two categories good and bad. Thus, from the sale analysis the admin can give farmer insights about various sales and which products are in demand.

4. **Google Cloud Module:-**

This module is used as a communication medium between farmer, customer and admin. We are using Google sheets as backend which is a non SQL database. It is free without charges and available 24X7.

IV. RESULTS AND DISCUSSION

Thus, to explain the above proposed system we have created 3 applications. One for admin desktop where he can analyze the products in 2 categories good and bad and upload on google sheer so that a user can order any product which they want to purchase. Some of the relevant screens are shown below.

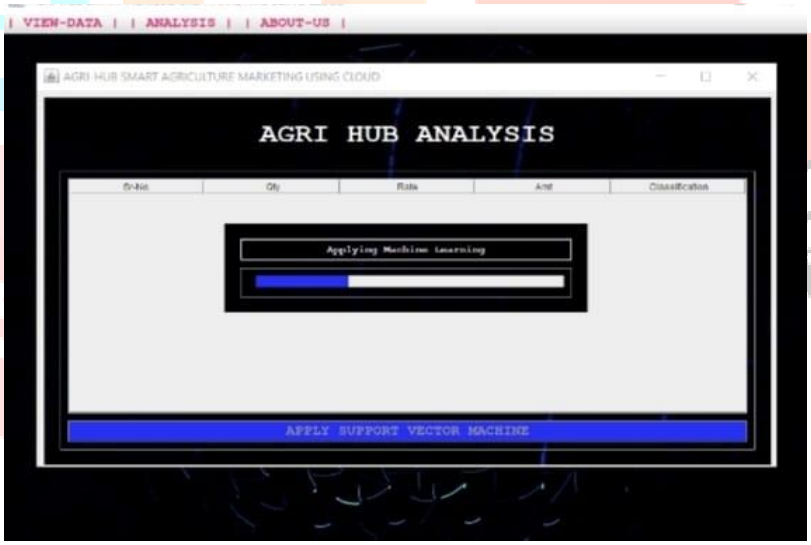

Fig.3: Finding the products

In Fig.3 it classifies the products in good and bad. First the training information are collected using application and added to training dataset. Then a testing dataset is provided to classify. Then the model is trained and save for testing purpose. After applying the model, it will classify each test passed to it using testing dataset which is further uploaded to the cloud so that the users can browse safely.

Fog.4: Block Diagram

V. CONCLUSION

In this paper, we are developed novel collaboration of farmers and customers directly using Direct Farmer to Customer (DFC) technology. The basic idea of the project was to apply machine learning and AES together to build a predictive technology for farmer and customer satisfaction. Thus, we have analyzed the languages needed to build the application and the cloud and security technology to handle the application.

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