



Krush Mitra- Expert System for Farmers using Kisan Call Centers Dataset and Machine Learning Concepts.

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Abstract

Agriculture is the backbone of the Indian Economy. Entire economy is sustained by agriculture, which is the main business of the villages. It contributes almost 16% of the overall GDP and accounts for employment of approximately 52% of the Indian population. Growth in agriculture is important for self-reliance and foreign exchange. Central government has started Kisan Call Center, Kisan Channel for farmers. Various news channels, TV channels are running shows for farmers.

Kisan Call Center is playing a vital role for farmers' query resolution. Satisfaction of farmers' query resolution is good and improving year by year. Farmers are calling the call center, but sometimes the line gets busy. Solution for this is that farmers need to send SMS and the solution will come from the call center. It shows farmers are using call centers very frequently and there is a need for an expert system which will work like Kisan Call Center and resolve the Query of farmers. We have designed an expert system which works on a dataset of Kisan Call Center and recommend Pesticide, Fertilizer and other solutions to their problem.

Keywords: Kisan Call Center Dataset, Data mining, Classification, Clustering, Decision tree.

1. Introduction

First, we should know what Kisan Call Center is and what it does for farmers. In order to harness the potential of ICT in Agriculture [5], the Ministry of Agriculture launched the scheme "Kisan Call Centers (KCCs)" on January 21, 2004. Main aim of the project is to answer farmers' queries on a telephone call in their own dialect. These call Centers are working in 14 different locations covering all the States and UTs. A countrywide common eleven digit Toll Free number 1800-180-1551 has been allotted for Kisan Call Centre. This number is accessible through mobile phones and landlines of all telecom networks including private service providers. Replies to the farmers' queries are given in 22 local languages.

Bee-keeping, Sericulture, Aquaculture, Agricultural Engineering, Agricultural Marketing, Bio-technology, Home Call center services are available from 6.00 am to 10.00 pm on all seven days of the week at each KCC location. Kisan Call Centre agents known as Farm Tele Advisor (FTAs), are graduates or above (i.e. PG or Doctorate) in Agriculture or allied (Horticulture, Animal Husbandry, Fisheries, Poultry, Science etc. and possess excellent communication skills in respective local language.

The problems faced by the farmers are yield losses, soil erosion, selection of crops, increasing chemical pesticides cost, pest resistance, diminishing market prices from international competition and economic barriers hindering adoption of farming strategies. Expert System are computer program that are different from conventional computer programs as they solve problems by mimicking human reasoning process, relying on logic, belief, rules of thumb opinion and experience

This expert system named KrushiMitra is based on Kisan Call Center datasets. On the basis of this database system recommends Fertilizers, Pesticides and also predicts future problems of crop. Kisan Call Center dataset records farmer's queries and answers of executive's for the queries. System uses machine learning algorithms to classify and form the groups of problems with solutions.

1.2 Literature Survey

Why do we need an expert system like KrushiMitra? Answer was given by a case study on Kisan Call Center presented by Shely Koshy, Sakeer Husain and Kishore Kumar. In this case study they briefly explained information about Kisan Call Center and usage of KCC services. As per their research farmers mainly use services of Kisan Call Center to get information about pests and diseases and according to their study farmers are satisfied with the service of KCC. However the farmers experienced problems in getting connected to the Call Centre. The farmers demanded alternate solutions as well as for field service following the advisory services [7]. So KrushiMitra could become an alternative solution for KCC services.

But one question arises, is there any expert system developed for farmers? After studying the research paper of Ahmed Rafea, we came to know that the following are the expert systems developed for farmers.

POMME (Roach et al., 1985) [3] is an expert system for apple orchard management. POMME advises growers about when and what to spray on their apples to avoid infestations. The system also provides advice regarding treatment of winter injuries, drought control and multiple insect problems.

COMAX (Lemon, 1986) [3] is a crop management expert system for cotton which can predict crop growth and yield in response to external weather variables, soil physical parameters, soil fertility, and pest damage. The expert system is integrated with a computer model, Gossym, that simulates the growth of the cotton plant. This was the first integration of an expert system with a simulation model for daily use in farm management. In 1987 expert system technology was identified as an appropriate technology to speed up agricultural desert development in Egypt. The research has shown the importance of applying expert systems in agricultural desert development in Egypt and suggested an integrated structure of an R&D unit to develop and maintain an efficient use of these systems.

CALEX system (Plant, 1989) [3] has been developed for agriculture management. It is domain independent and can be used with any commodity. CALEX consists of three separate modules: an executive, a scheduler, and an expert system shell. The executive serves as the primary interface to the user, to models, and to the disk. The scheduler generates a sequence of management activities by repeatedly activating the expert system. The expert system makes the actual management decisions. Initial development of the system has focused on the development of a package of modules for California cotton and another package for peaches.

2. Objectives of system

1. It gives expert suggestions to farmers for betterment of crops.
2. It suggests pesticides as per diseases, fertilizers as per crop and season and also it will predict future diseases and required pesticides.
3. It acts as farmers' mentor for that it will make use of the historical and current dataset of Kisan call center.
4. It decreases the load of Kisan Call Center.

3. Design and implementation of system

System makes use of machine learning concepts and different algorithms. First, we should know what machine learning is. Machine learning is an interdisciplinary research area which combines ideas from several branches of science namely, artificial intelligence, statistics, information theory, mathematics, etc. [4]. Machine learning focuses on developing algorithms which will make predictions based on dataset. System will use the following machine learning algorithms.

1. Classification Algorithm

It is one of the Data Mining algorithms. That is used to analyze a given data set and take each instance of it. It assigns this instance to a particular class. Such way that classification error will be least. It is used to extract models. That defines important data classes within the given data set. Classification is a two-step process.

During the first step, the model is created by applying a classification algorithm. That is on a training dataset then in the second step, the extracted model is tested against a predefined test data set. That is to measure the model trained performance and accuracy. So classification is the process to assign a class label from a data set whose class label is unknown.

2. Clustering Algorithm

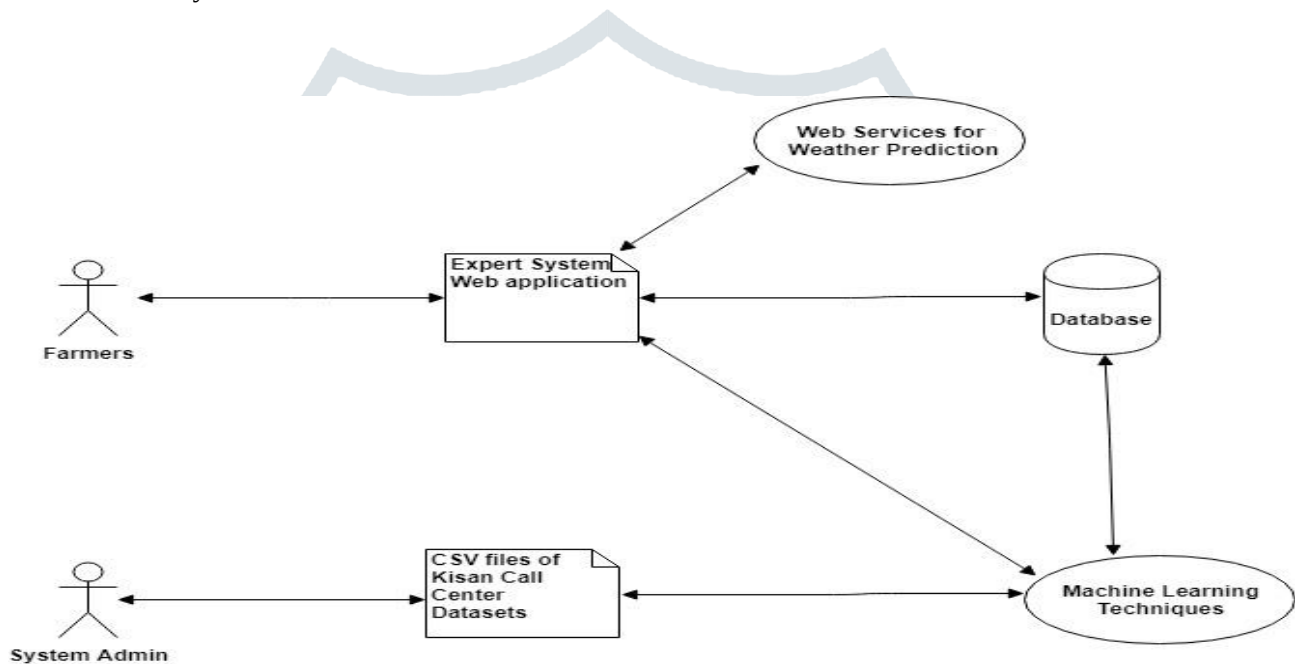
In clustering the idea is not to predict the target class as like classification, it's more ever trying to group the similar kind of things by considering the most satisfied condition: all the items in the same group should be similar and no two different group items should not be similar. To group the similar kind of items in clustering, different similarity measures could be used.

3. Decision tree

A decision tree is a tree where each node represents a feature (attribute), each link (branch) represents a decision (rule) and each leaf represents an outcome (categorical or continuous value).

The whole idea is to create a tree like this for the entire data and process a single outcome at every leaf (or minimize the error in every leaf). Decision trees often mimic human level thinking so it's so simple to understand the data and make some good interpretations.

3.1 Implementation of System



Functional Block Diagram of KrushiMitra Expert System

3.1.1 Farmers

This system is designed for farmers so farmers are the main users of the system. Farmers need to register themselves with the system by using the registration form of the system. After that they can log in and they can use the system.

Following types of inputs farmers need to provide.

1. What are the problems they are facing with the ongoing crop?
2. Details of ongoing crops.
3. Details of planned future crops.

Farmers get the following things from the system.

1. Pesticide and Fungicides as per crop, problems and season.
2. Notification about future problems related to crops and solutions.

3. Notification about fertilizers.
4. Weather report of current and future days.

3.1.2 Expert System

Krushimitra is a web application. System is developed by using the following technologies.

Client Side Technology

1. HTML, Bootstrap
2. JavaScript, JQuery.

Server Side Technology

1. PHP, CodeIgniter Framework.
2. MySQL Database

Machine learning concepts and algorithms are implemented through PHP. Why do we choose PHP? Answer is simple PHP is lightweight scripting language and its Codeigniter framework provides different inbuilt functionality for web application development. PHP is free source and working with MySQL is very easy.

Internal working of system

1. System takes input from farmers and performs operations on the database and provides solutions.
2. System interacts with a web service server for weather report prediction.
3. Admin uploads a CSV files of datasets then system makes use of machine learning algorithm i.e. classification algorithm and classifies records in database, According to given a set of n attribute (Query, crop type, crop name, season (Kharip, Rabbi), category of problem statement, solution), classified into a set of k classes (District, crop name, State, Month of Year) with sets of labels (MH 09, MH 10, MH 13, MH 11 etc.). After this system forms the cluster of classified result by using Clustering algorithm. For that system uses SQL queries as per requirement.

For example: insert into table2 Select Label from table1 where Label ='Label name' in this Label name may be Crop name, Disease name, Crop Category name.

4. As per problems submitted by farmers, the system takes decisions and shows solutions to farmers.

3.1.3 Web services for weather prediction

System uses web services for weather prediction. System shows the current and next week weather report. Web service provider sends JSON data to system. System renders JSON data and shows results on a web application.



Interaction between Krushimitra and weather prediction web service providers server

3.1.4 Database

Krushimitra system uses MySQL database. MySQL is a free licensed database and it is part of the XAMPP server. MySQL works very well with PHP. Database of the Krushimitra system is normalized so it gives fast results.

3.1.5 System Admin

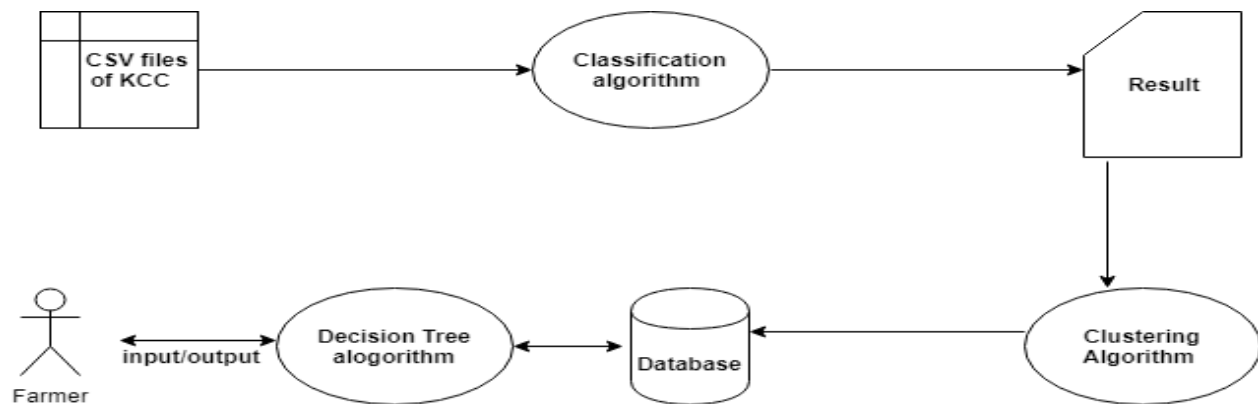
KrushimiMitra needs system admin to upload the latest CSV files of KCC and for the maintenance of web applications. In KrushiMitra, the admin panel is designed for system admins to perform their duties.

3.1.6 CSV files of KCC

Every month Kisan Call Center releases district wise CSV files. The CSV file contains questions asked by farmers and answers given by executives to these questions. Admin downloads these CSV files from GOV.in and uploads them to the system.

3.1.6 Machine Learning concepts

KrushimiMitra uses different machine learning algorithms for data uploading, data formation and for data selection.



Implementation of machine learning algorithms in KrushiMitra System

As you can see in the above diagram how KrushiMitra system uses machine learning algorithms. System applies classification algorithms on CSV files and classifies the result. On classified results again the system applies a clustering algorithm. System saves the result into the database. It uses a decision tree algorithm on inputs submitted to the system and provides output to farmers.

4. Screenshots of system

4.1 Home page of System.



4.2 Registration of farmers

4.3 Ask Problem window

4.4 Solution from expert system

The screenshot displays the KRUSHIMITRA web application interface. A modal window titled "Solution for asked Problem" is centered on the screen. The modal contains three input fields: "Crop Name" with the value "Lady Finger", "Asked Problem" with the value "Leaf cutting Bees", and "Solution for Problem" with the value "Spray Confidor 20 ML with 15 liter water". The background of the web application shows a navigation bar with "HOME" and "ASK PROBLEM" links, a search bar, and social media icons. The main content area features agricultural images and text like "RIGHT CHOICE", "IMPROVING CULTURE, SAVING LIVES.", and "HIGH ADVANTAGE OLD FASHION SEED".

5. Conclusion

This expert system provides expert solutions to farmers very fast and its availability is better as compared to Kisan Call Center. The system also predicts future problems and solutions. In future we can do following work

1. System will predict the rate of the local market as per crop and give suggestions to farmers before sowing.
2. We can develop mobile applications for the system for better availability.
3. Through mobile applications, image processing systems can detect diseases of crops and suggest pesticide for the same.

6. References

1. Design of fertilization recommendation knowledge base and application Zhouqiao Ren ; Xiaonan Lu 2012 First International Conference on Agro- Geoinformatics (Agro-Geoinformatics)
2. Big Data Analytics Framework to Identify CropDisease and Recommendation a Solution Er. Rupinder Kaur Punjabi University, Patiala, Krupinder884@gmail.com Raghu Garg, Research Scholar, Punjabi University, Patiala, raghugarg@hotmail.com, Dr. Himanshu Aggarwal, Prof, Computer Engineering, Punjabi University, Patiala, India, himanshu.pup@gmail.com
3. Expert System Applications: Agriculture Ahmed Rafea Central Laboratory for Agricultural Expert Systems P.O.Box 100 Dokki Giza Egypt rafea@esic.claes.sci.eg
4. A survey of machine learning algorithms for big data analytics S. Athmaja ; M. Hanumanthappa ; Vasantha Kavitha 2017 International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS)
5. Development of rice cultivation management expert system based on jess Wenlong Yi ; S. A. Kuzmin ; Huojiao He 2016 XIX IEEE International Conference on Soft Computing and Measurements (SCM)
6. Study on the Expert System of Cropping System in China Chunjiang Zhao ; Xunhao Liu Proceedings of International Conference on Expert Systems for Development
7. Agricultural information delivery mechanism using ICT: A case study from Kerala, India, Shely Koshy ; Sakeer Husain ; Kishore Kumar, 2015 IEEE International Symposium on Technology and Society (ISTAS)