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Disease Prediction of Pomegranate using Data Mining

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Abstract

Data mining technique such as classification helps to do the prediction of the crops diseases, production of crops and loss. It supports farmer while taking right decisions. Agriculture Research is rapidly growing, due to elevation of technologies and upcoming challenges now a days. It has been proven that leading role in increasing the overall growth rate of any country. Climate changes have an adverse effect on agriculture. The traditional methods required for agriculture are planning, fertilizing and harvesting against predetermined schedule. Atmospheric parameters like temperature, rainfall and humidity are important for agriculture systems. Weather fluctuations and improper cultivation methods results in to the loss of crop productivity. To deal with climatic changes and the its various adverse effects disease prediction system of pomegranate will help to predict the disease at early stage and will avoid the loss of crop and increase the productivity. Classification technique of Data Mining helps to predict the crop diseases, production and loss.

Keywords: *Agriculture, Fertilizing, Atmospheric Parameters, Weather Fluctuations, Data Mining, Classification.*

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I. INTRODUCTION

In India the sustainable agriculture development is fundamental to meet food demands, economic growth and poverty reduction. India is leading country for pomegranate production. Climate changes have adverse effect on agriculture and traditional practices followed are planning, fertilizing and harvesting against predetermined schedule. To deal with climatic changes and its various adverse effects disease prediction system for pomegranate farm will help to predict the disease at early stage and will avoid the loss and increase the productivity. In this system data mining technique SVM classifier is used for classification of data.

Crop losses for pomegranate due to diseases and pests are quite normal in case of semi-arid region conditions. Bacterial blight, thrips, fruit borer and wilt this diseases in pomegranate are considered powerful attacks leading to economical loss and force farmers to repetitive sprays. Agriculture environment is dynamic entity and changing continuously. Ground water depletion, soil erosion, attack of new pest and diseases, fragmentation of land, rural-urban migration and power supply availability for farm are some of the new challenges presently being encountered in the agricultural sector. To overcome these issues we have proposed system called an agro advisory. Advisory contains the recommendations to the farmer related to water irrigation, nutrient management and spray scheduling management for diseases and pests with proper application.

1.1 Motivation

- In India production of pomegranate is very high.
- We use the early detection strategy for the pomegranate diseases.
- Use of the previous data by using database and current data using sensors.

1.2 Need of the system

The currently followed system consists of manual implementation of all the things and traditional practices. Here are the few points listed showing why actual need of system.

- Scheduling of irrigation.
  - Weather based
  - Soil moisture based
  - Plant based

- Soil report which gives the information about the soil(i.e nutrients available in soil).
- Climate impacts on agriculture in case of productivity, agriculture practices, environmental and rural.
- There is need to apply precision agriculture in the context of pomegranate crop.

II. PROPOSED SYSTEM

In our proposed system Sensors are deployed in pomegranate farm and are used to sense the real time values of metrological parameters such as temperature, humidity, etc. The Gateway is used to collects the data from sensors which are deployed in pomegranate farm and sends that collected data to the database and database stores the real time data values collected from sensors through gateway and also the historical data. Then the data pre-processing is used to transform the raw or inconsistent data into understandable format, here SVM is used for training and classification of data. It is used to predict the disease. So here the disease on pomegranate is detected in early stage.

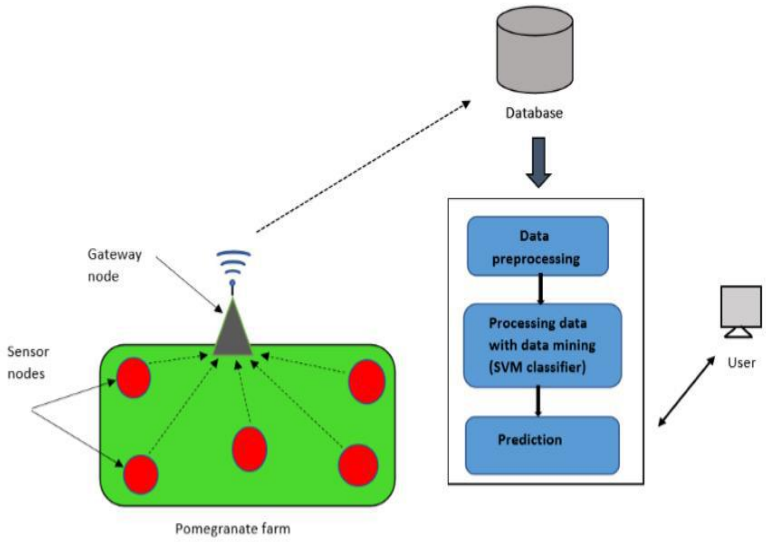

Figure1: System Architecture

III. MATHEMATICAL MODEL

A mathematical model is used to describe the system using mathematical concepts and language. The process of creating a mathematical model is is known as mathematical modeling. Mathematical models are also used in social sciences as like used in the natural sciences and engineering disciplines. A model is used to explain the system and to study the consequences of different components and to make prediction about behavior. Mathematical models can take many forms but not limited to dynamical system, statistical systems, differential equations or game theoretic models.

According to set Theory the relevant mathematical model for our project is designed below.

Let, System as S set

Where,

Set S = {I, P, R, O} (1)

{ I } is set of all inputs which are given to system.
{ P } is set of all processes in system.
{ R } is set of rules that handles your input set.
{ O } is set of expected system output.

- **The Input (I) :** represented as :

$$I = \{I1, I2, I3, I4\} \quad (2)$$

Where,

I1 : User Information.
I2 : Admin information.
I3 : Sensor data.
I4 : Historical dataset

- **Processes (P) :** is represented as :

$$P = \{P1, P2, P3, P4, P5\} \quad (3)$$

Where,
P1 : Registration and Sign in
P2 : Data Preprocessing.
P3 : Classification.
P4 : Disease Prediction.
P5 : Agro Advisory.

- **Rules (R) :**

$$R = \{R1, R2\} \quad (4)$$

Where,
R1 : Web server should be always available.
R2 : Browser should support the features of web app.

- **Output (O) :** is described as :

$$O = \{O1, O2, O3\} \quad (5)$$

Where,
O1 : Disease Predicted
O2 : Pesticides Suggested
O3 : Current weather condition report

IV. OVERVIEW OF PROJECT MODULE

Sensors are deployed in pomegranate farm and they are used to sense the real time values of metrological parameters such as temperature, humidity, etc. Arduino collects the data from sensors which are exerted in pomegranate farm and sends that collected data to the database. It stores the real time data values that are collected from sensors through gateway and also the historical data. It is used to transform the raw or inconsistent data into understandable format. SVM is used for training and classification of data. It is used to predict the disease. Depending upon metrological parameters the diseases like as bacterial blight, Alternaria fruit rot, wilt, etc are predicted and notified to the user along with agroadvisory. User can register to the system and notification will be sent on their registered mobile number.

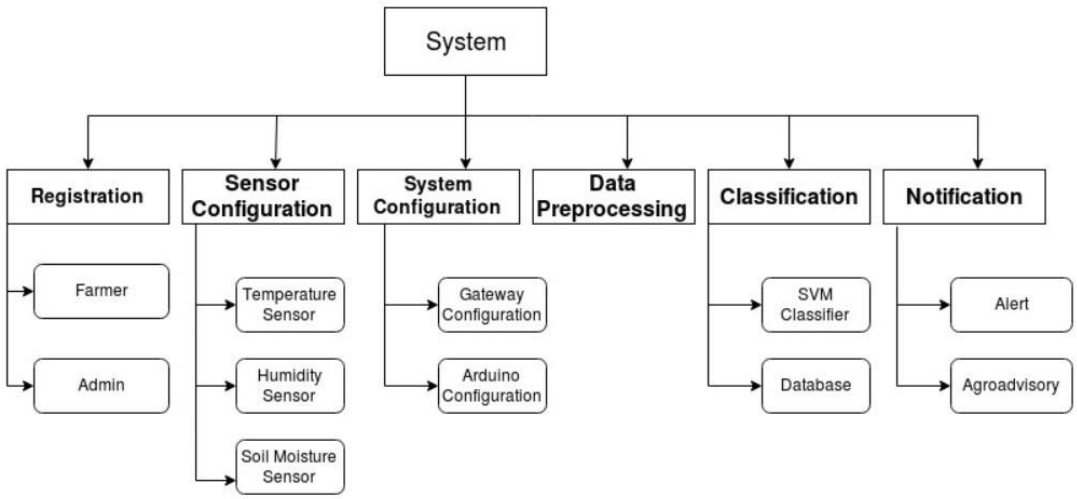

Figure2: System Modules

Below is description of the system modules,

• Registration Module

Registration can be done by both user and system and then can login into the system. User need to register first to get the alerts from the system. User will get alerts and agroadvisory on registered mobile number.

• Sensor Configuration Module

The module consists of different types of sensors like Temperature sensor, Humidity sensor, Soil moisture sensor, etc

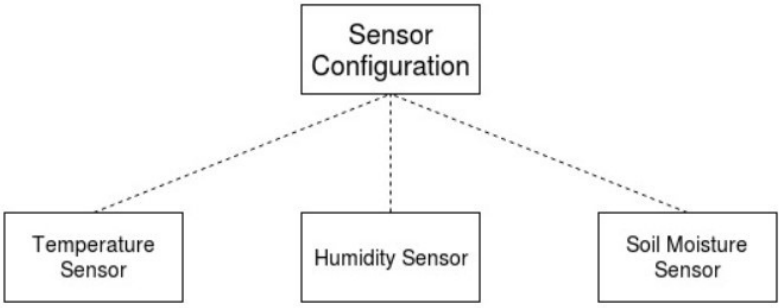

Figure3: Sensor Configuration

• System Configuration Module
System Configuration is the configuration of hardware and software components of the system.It includes gateway configuration, Arduino Configuration, etc.
• Data Preprocessing Module
In this module the raw or inconsistent data is transformed into understable format.After preprocessing the prepared data is used for classification.
• Classification Module
In this module current weather parameters are sensed by the sensors and then classification is done by using the SVM classifier. Disease is predicted by comparing the current sensed values with training dataset or historical database.

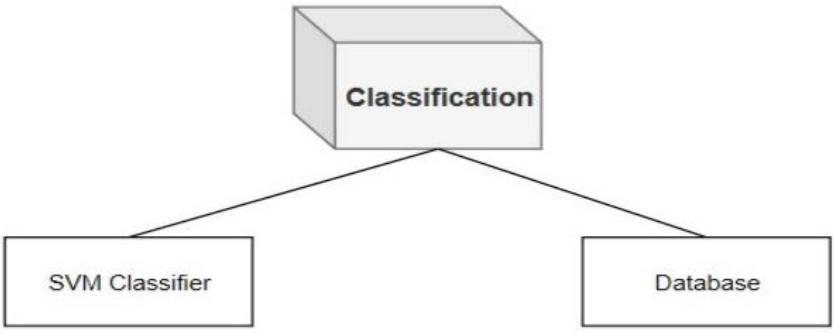

Figure4: Classification Module

SVM Classifier works as follows:

1. Firstly plot the point in n-dimensional space(where n is number of features yoiu have).The value of each feature should be the value of each co-ordinate.
2. Then draw the all possible hyper-planes that differentiate data into two classes.
3. Draw margins for each hyper-plane. Margin is the maximizing distance between nearest data point.
4. Select the hyperplane with higher margin that segregates the two classes better.
5. Now the dataset is classified into two classes i.e diseased and Non-diseased.

• Notification Module
This module consists of prediction of diseases such as bacterial blight, wilt, etc and sending alert to farmer and also suggesting pesticides to be sprayed i.e. Agro advisory.

V. APPLICATION

1. This system is used in agriculture.
2. It is Useful for the farmers to predict the diseases.

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VI. CONCLUSION

Disease prediction System in Pomegranate farm helps to predict the disease at early stage using SVM classifier and sends the notification to the farmer regarding the current metrological parameters and name of the pesticides to be sprayed. It will helps the farmers to increase their productivity rate and quality of pomegranate fruit.

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