ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 4, Issue 11, November 2017

Review on Crop Pests Forewarning With Weather Factors Using Machine Learning

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***Abstract*— Overall climate change is nothing but diversity in the weather patterns of various regions of the world. The term "weather" refers to the short term changes in temperature, rainfall, and humidity of a region. With the up-gradation in data mining and its applications, data mining is extensively used to make smarter decisions in farming. Various meteorological data like- temperature, humidity, rainfall plays the vital roles in the growth of pests responsible for damaging the agricultural production. Effective forecasting of such pests on the basis of climate data can help the farmers to take prior actions to restrain the damages. This can also justify the use of pesticides, which are one of the sources behind soil pollution. In this study we are going to implement application, which gives the notification to farmers, if there is change in environment, so based on that changes which type of pest's along with their population affects the crop, such type of notification will be generated on web service portal. Weather based forecasting system can be treated as a part of the Agricultural Decision Support System, which is knowledge based system. Web service portal is used to collect the data regarding physical parameters, using a sophisticated web service platform, using longitude and latitude concept.**

Keywords— Agricultural Decision Support System (ADSS), Agriculture Prediction, Meteorological Data, Weather Monitoring, Web services.

I. INTRODUCTION

Agriculture is the backbone of our economic system. Agriculture provides maximum employment in the country. Unfortunately, crop production is heavily affected by the pests and diseases. Pest damages huge amount of the agricultural production. It is essential to switch agricultural methods to precision agriculture mainly to increase agricultural productivity. Web service has the potential to make the world friendlier for present and future generations of mankind. Web portal from traditional can be deployed in numerous ways for sustainable development. Web services can be used to get physical criterion of specific location which will get from longitude and latitude values. Discrete knowledge in weather and climate data leads to quantitative and qualitative improvement in agricultural production. The observations of atmospheric environment data relating to organism response to varying environment includes agricultural crops, stages of their growth, development as well as pathogenic elements affecting them. After green revolution concept in India, uses of chemical pesticides and fertilizers were increased. Irrational use of pesticides creates a problem with the crop quality, land quality and the human health. Uncontrolled use of pesticides creates an economic loss to farmers as well as crop quality. Temperature, precipitation and solar radiation are the main drivers of the crop production. Forecast based on temperature and precipitation is important to agriculture. Extreme Climate conditions also negatively blow agriculture production, pest and diseases. Weather based forecast provides the early cautioning to the farmers. This guides to take the timely action against the diseases. We are going to design a web service portal which is very useful to farmer for obtaining the environmental variation data. Farmers can enter their location in web portal, then depending on that location longitude and latitude values are used to get the physical parameters using web services. Depending on that environmental condition which pest can attack or affect the crop which is planted in farm. So it is useful for farmers, once message prompts on web portal then farmers can be able to treat as per requirement. For obtaining the location longitude and latitude values are used and using web services environmental data such as humidity, temperature, wetness, moisture etc. can get on web portal. Precision farming is an emerging methodology in today's context of agriculture and it definitely holds the key in the future.

II. LITERATURE SURVEY

Many researchers have tried to use data mining technologies in areas related to meteorology and weather prediction. Data mining is the process of automatically

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discovering useful information in large data repositories [1]. Data mining techniques are used in different fields like medical diagnosis, weather data and agricultural field. Climate change can also be referred to as the variation in the global climate or in regional climates overtime. It describes changes in average state or variability of the atmosphere overtime. Clustering approach for Monitoring Weather Based Meteorological Data is described by Shobha N. Dr. Asha T [1]. In data mining there is study of agricultural meteorological patterns collected from meteorological center. The results indicate that Hierarchical technique is better than K Means to facilitate effective analysis of data, the proposed work uses clustering techniques to predict minimum and maximum air temperature, relative humidity, rainfall and effect of these weather parameter, knowledge interpretation obtained after analyzing these patterns help farmers to undertake any prior measures to prevent disease, fertilizer usage, to obtain better yield and this information can also be shared between the farmers through messages. Then we compared two algorithms using internal validation measures, we observed that Hierarchical algorithm performs better than K Means algorithm.

A fuzzy logic based structure for the plant disease forecasting system described by Shamshirb and Ali Za'fari [4]. Fuzzy logic defines the linguistic variables. This expert system estimates the occurrence of disease in the plant. This is an end to give a thought of fuzzy logic structure for weather based plant disease forecasting. Implementation and Realization of expert system having an estimation of most of the plant disease are a future task. A method of finding chemical composition on rice samples, using data mining techniques such as classification, support vector machine, random forests and neural network models are proposed by (Camila Maione et al.) [3].The rice samples obtained from Midwest region and south region of Brazil. Random forest methodology is used for variable selection purpose and finding missing values in the data set by computing proximities. Most important minerals (Na, Sn, P, F, S) and least important minerals (Zn, Cr, Be) were found in an organic and conventional grape juice using classification models. Shakoor, Rahman, Rayta describe Supervised Machine Learning Techniques for Agricultural Production Output Prediction [6].In this research it suggests area based beneficial crop rank before the cultivation process. It indicates the crops that are cost effective for cultivation for a particular area of land.

To achieve these results, the prediction is based on analyzing a static set of data using Supervised Machine Learning techniques. The research has intent to use Decision Tree Learning and K-Nearest Neighbors Regression algorithm. The research provides a solution to this problem which was much needed for farmers in Bangladesh. Though the research is limited to some fixed dataset, the future ahead promises addition of more data that can be analyzed with more machine learning techniques to generate crop predictions with better precision. Moreover, the research can result in profits and invention of advanced farming techniques that can improve our economy and will help us stand out as a technologically advanced country. To determine most influential weather parameter on evaporation from soil and vegetative surface and transpiration from plants using adaptive neuro fuzzy inference system (ANFIS) by (Dalibor Petkovic et al.) [5]. Weather data sets for seven meteorological parameters such as maximum and minimum air temperature, maximum and minimum relative humidity, actual vapor pressure, wind speed and sunshine hours were taken from 12 weather stations in Serbia for the period 1980-2010 is used as input data.

III. DISCUSSION

a) Weather Based Plant Disease Forecasting Using Fuzzy Logic:

Weather based forecasting system can be considered as a part of the Agricultural Decision Support System (ADSS) which is Knowledge Based System (KBS). This paper proposes fuzzy logic based structure for the plant disease forecasting system.

b) Monitoring Weather Based Meteorological Data Using Clustering Approach:

Weather plays an important role in the development of pests. This paper describes a data mining study of agricultural meteorological patterns collected from meteorological centre.The results indicate that Hierarchical technique performs better than K Means

c) Agriculture Production Output Prediction Using Supervised Machine Learning Techniques:

The prediction is based on analyzing a static set of data using Supervised Machine Learning techniques. The research has an intent to use Decision Tree Learning- ID3 (Iterative Dichotomize 3) and K-Nearest Neighbors Regression algorithms. A leaf is an important part of the plant. The majorities of the pathogens are developed and

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grow on the surface of the leaf. Leaf wetness duration plays an important role in the growth of a disease. Leaf wetness duration is given as a degree of moisture associated with the vegetation [8].LWD can measure by two approaches. The first and the foremost is use of various sensors. The second method is estimation of LWD by means of mathematical models. Measurement and accuracy of the LWD using sensor depends upon the number of sensors placed as well the location of the sensors. Evaluation of LWD using mathematical approach associate with a measurement of various variables like soil moisture, wind speed, heat reflux rate etc. [2]. Temperature and relative humidity parameter is primarily important for the estimation of Leaf wetness duration.

IV. PROPOSED SYSTEM

Crops production is heavily affected by the pests and diseases. Pest damages huge amount of the agricultural production. To increase agricultural productivity farmers have to switch from traditional agricultural methods to precision agriculture. Extreme climate conditions also negatively blow agriculture production, pest and diseases. Weather based forecast gives the early warning to the farmers, in return which helps them to take the prior actions against the pests. As shown in fig-1 we develop an application which is useful for farmers for obtaining environment variation data so that they can take some prior measures to avoid the damages. In our proposed system user is able to access application, from that application user can give input. After specifying, input data is processed in data storage system. There are two important factors in our system first one is Weather data acquisition system and second is Pest prediction system. Weather data acquisition gets the weather information or data from data files and passed that data to data storage system. Disease prediction systems then acquire that data form historical data and after processing that data it returns to data storage system.

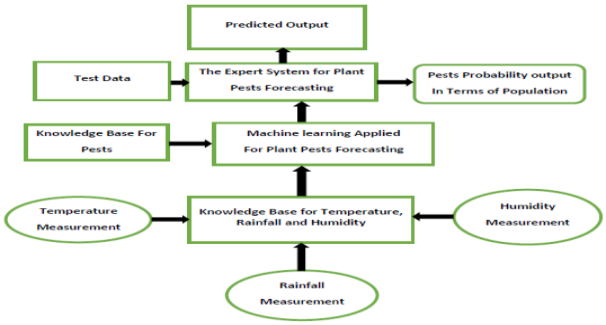

Figure 1: Pests Prediction System for crop.

V. METHODOLOGY

A. THEMETEOROLOGICAL DATASET

For dataset we have to gather data which includes agricultural meteorological data for minimum 30 days. We have to obtain these data from meteorological center. Data includes parameters such as air temperature dry, relative humidity, air temperature wet, cloud, pan evaporation. These are the input parameters for application based on these data we are able to generate a result.

B. DATA MINING METHODS

Main Objective of the data mining is to discover hidden patterns in a data set [1]. Different types of data mining task includes classification, association analysis and cluster analysis. In this study, we used K Means and Hierarchical clustering techniques to predict patterns in the data set.

C. CLUSTER ANALYSIS

Clustering is unsupervised learning [1]. Cluster analysis is association of data objects established on information initiate in the data that describes the objects and their relationships. Instances in a data set are characterized by the values of features or attribute that measure different aspects of the instance. Algorithm forms cluster by considering attribute values such as air temperature, relative humidity, rainfall and pan evaporation etc.

D. K MEAN CLUSTERING

K Means clustering algorithm takes the input parameter k and partitions a set of n objects into k clusters [1]. By clustering data according to an attribute hierarchy makes better prediction about minimum temperature, maximum temperature, relative humidity during morning and noon hours and rainfall. Cluster similarity is measured with respect to the Mean value of the attributes in a cluster.

E. HIERARCHICAL CLUSTERING

Hierarchical clustering methods partition the data set into subsets represented by a hierarchical data structure [1]. Clusters are procured by combining the subsets at various levels using the maximum distance criteria.

VI. CONCLUSION

This paper presents a pests prediction system based on weather parameters. Implementation of such a system in the field of agriculture can definitely help to improve the yield of the crops and overall production. Using this

approach we able to control Pests population with the optimum use of pesticides. Weather based pests forecasting is one of the methods of IPM. Various meteorological data like temperature, relative humidity, and rainfall are used for the early detection for probability of pests in crops. We are going to use clustering techniques to predict minimum and maximum air, temperature, relative humidity, rainfall effect of these weather parameters on the crops. Knowledge interpretation obtained after Analyzing these patterns help farmers to undertake any measures to prevent pests, fertilizer usage, to obtain good yield.

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