"Analysis of diseases of plants using Big Data and IoT"

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ABSTRACT

This paper aims to design a model for agriculture to predict the diseases of plants using Big Data analytics and IoT Technology.

INTRODUCTION:

Farmers, in developed countries generate and capture huge agricultural data using mobile technology, which are stored and later retrieved by application softwares with the help of the database management softwares. Information is a fundamental and an essential element of any activity in agricultural sector. Information and communication technology (ICT) is extensively utilized in farming to provide indispensable information at right time and at a least expense.

Emergence of **ICT (Information and Communication Technologies)** plays an important role in the agriculture sector by providing services through computer-based agriculture systems. But these agriculture systems are not able to fulfill the needs of today's generation due to processing of large amount of data, lack of important requirements like processing speed, data storage space, reliability, availability, scalability etc. and even resources used in computer-based agriculture systems are not utilized efficiently.

In traditional agriculture, a schedule is predetermined considering factors such as rainfall, suitable weather, etc., and all tasks are performed in order accordingly. Despite their efforts, farmers face difficulty in making proper decisions due to lack of essential information at appropriate time. Thus, it is required to collect real time data on weather, air quality, soil fertility and information about diseases so as to make proper decision. This way of farming is known as Precision agriculture.

Role of ICT in agriculture:

The potential contribution of ICT to agriculture can be viewed through cost reduction, increase of efficiency and productivity improvement.

Precise farming that is popular in developed countries is based on intensive use of ICT and it contributes directly to agricultural productivity. In order to increase agricultural production, techniques of remote sensors with support of satellite technology, geographic information systems (GIS), agronomics and soil science are applied. ICT supports farmers to track and react to weather condition changes on daily basis. Meteorological stations on field supplied with solar energy can be connected to computers of farmers in order to send information on current temperature of air and soil, rainfall, relative humidity of air, moisture of leaf, moisture of soil, length of day, speed of wind and solar radiation.

Role of IoT in agriculture:

Internet of Things is a technology which tends to connects all the objects in the world to the Internet. It involves the use of RFID, wireless and other sensors with Internet stack inbuilt into the device. Applications are developed based on IoT enabled devices for monitoring and control in various domains including industrial processes, home appliances, health monitoring applications, smart homes, and smart cities. In agriculture domain few researchers have proposed architectures based on IoT to monitor supply chain management of agricultural products. Wireless Sensor Networks is said to be mature technology and lot of work has been done for agriculture domain. Sensors are available for sensing and analyzing the various parameters that are required in agriculture domain. Many applications are in use which utilizes sensors in agriculture. WSN architectures were proposed, implemented and tested for monitoring the soil properties.

Role of Big Data analysis in agriculture:

The agricultural data can be classified as private data and public data.

Private Big Data: This data set contains data obtained at the production level and generated by an individual farmer. It mainly includes information regarding ones farmer's field, soil type, irrigation level, yield, livestock, etc.

Public Big Data: At public level, there are funded agencies which collect, maintain and analyze data records. The records may contain data about weather conditions, soil survey, farm program participant records, marketing, etc.

Stages in Big Data process are collection of data, managing aggregated data, and effective usage of processed data technology and detection algorithms, chemical/gaseous sensors to measure gaseous emission from fields (like during ripening of fruits, flower pollination, etc.) and ultrasonic sensors to detect underground water availability for irrigation.

OBJECTIVES OF THE STUDY:

1. To study the occurrences of existing grapes plants diseases including its symptoms in early stage to mature stage.
2. To study the atmospheric conditions affecting grapes plants for various diseases.
3. To assimilate the collected data in dataset format by using IoT sensors.
4. To apply BI tools for various disease analysis on data set.
5. To develop mobile app for prediction of various diseases of grapes plants.

SCOPE OF THE STUDY:

The occurrences of various diseases on grapes plants are considered. For the study purpose the agriculture field from western region of Maharashtra will be considered. However this is not possible to study on whole region, thus, the sample will be collected from only 1 acre agriculture land and detail study will be done on this sample. Therefor the scope of the study is limited to only on plant i.e. grapevines and agriculture land is also limited to only 1 acre.

STATEMENT OF THE PROBLEM:

The existing system uses the cloud application or MATLAB to analyze the data which include the image processing in MATLAB as well as data mapping with the existing data in the database. The problem of this model is, its main emphasis to predict the disease is based on the image of plants, so it should require the clear pictures of leaf, stem and shoots with various angles. And if the picture is not clear then it would be difficult to process the data and analyze, therefore there is need of proposed study.

Internet of Things (IoT), Wireless Sensor Networks and Sensors:
Internet of Things is a technology which tends to connects all the objects in the world to the Internet. It involves the use of RFID, wireless and other sensors with Internet stack inbuilt into the device. Applications are developed based on IoT enabled devices for monitoring and control in various domains including industrial processes, home appliances, health monitoring applications, smart homes, smart cities .In

The proposed system basically consists of automated plant disease recognition by using visually seen symptoms of disease, i.e. stem and leaf. The system works on the inputs provided by different wireless sensors which will be deployed in the field using the **Internet of Things**. As well as visual identification of disease is done where images are captured through camera and processed and suggest the treatment for the corresponding identified disease.

METHODOLOGY AND TECHNIQUES TO BE USED:

1) Big Data:

Big data is well understood by knowing its characteristics which are known as 3V's; volume, variety and velocity.

1. **Volume** -- It refers to the enormous amount of data generated at every second. It is estimated that about 2.3 trillion gigabytes of data is created every day.
2. **Variety**— Data can be in different formats and from different sources. Unlike earlier days, data is now more unstructured, data may be in forms such as photos, sensor data, encrypted packets and so on. Hence it requires advanced technology and tools to store and analyze raw big data.
3. **Velocity**— the speed with which data is collected, stored, analyzed and distributed to end users defines the quality of big data management.

Data Management and Analytics:

The primary aim of data management is to make sure that end users get high quality data with easy access. Here are few tools to manage and analyze big data generated from agricultural sector:

1. **Hadoop:** It serves as a core platform to structure big data. It is a Java platformed programming framework and hence supports processing of large data sets in distributed computing environment.
2. **MapReduce:** MapReduce is programming paradigm sup-ported by Hadoop to handle parallel processing of big data distributed across a large number of computers.
3. **HDFS:** Hadoop Distributed File System, a high performance data access tool used across Hadoop clusters is the primary storage system used by Hadoop applications.
4. **HBase:** It is a column oriented data base management sys-tem which runs on top of Hadoop. It is well suited for sparse data sets.

agriculture domain few researchers have proposed architectures based on IoT to monitor supply chain management of agricultural products.

CONCLUSION

In this study we will make an attempt to bring out the significance of the role played by big data analytics along with IoT in precision agriculture which has radically changed the field of agriculture. This model provides Big-Data analysis for the prediction of various diseases on grapes plants and mobile application provides the suggestion to farmers that what precaution has to be taken to prevent from the diseases so as to improve the yield.

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