CROP PREDICTION BASED ON IOT: TEMPERATURE AND RAINFALL MONITORING

Dr. G. Amirthayogan[1] Ms. Surabi Parida[2,] Department of Computer Science & Engineering
Raajdhani Engineering College

ABSTRACT:
Farming is the main supporter of the Indian monetary framework. The horticulture crop creation relies upon the climatic, organic and financial variable. Today, agribusiness, ranchers are making yield as well as make the horticulture information. This advisers for new strategies and methods, for example, information mining that can associate the information on the information to the harvest yield assessment. To further develop the harvest yield, pick the best yield, consequently expands the quality and productivity of the horticulture area utilizing information mining procedures. A colossal measure of information is gathered in agribusiness and various information mining strategies are utilized to track down proficient yield according to the climatic condition. Accuracy farming is as of now embraced in different nations, yet we actually need to include IoT and distributed computing advancements for improved creation of harvests. At present the environment contrasts in numerous areas around India because of different variables from human exercises like air contamination, deforestation, sewage and from normal changes like distance of ocean, wind bearing, vicinity to the equator. According to the progressions in the environment, a rancher needs to foresee which harvest ought to be developed when. The dataset stores the subtleties of the yield which ought to fulfill the necessities like most extreme and least temperature, greatest and least precipitation andlocation.
This examination work presents a nitty gritty investigation of further developing harvest yield by anticipating the yield for the particular area according to the climatic changes. The ongoing temperature and precipitation range information can be gathered by utilizing DHT11 Temperature Sensor and Soil Dampness Sensor associated with Raspberry Pi. The gathered information's (area, temperature worth and precipitation range) are put away in AWS IoT. Associations with far off areas can undoubtedly accomplished by utilizing informing convention like MQTT (Message Line Telemetry Transport). The Choice trees are flexible AI calculation that can perform both grouping and relapse undertakings in foreseeing the yield to be developed in a comparing area according to the climatic changes. The caret bundle (Characterization And Relapse Preparing) is a bunch of capabilities that endeavor to smooth out the cycle for making prescient models and to develop a choice tree which has a yield as an objective field. Amazon QuickSight peruses information from AWS stockpiling administrations to give specially appointed investigation and examination view by contrasting the temperature and yield of comparing area.
Keywords: *Raspberry Pi, MQTT,DHT11, AWS IOT, Quick Sight, AWS, Machine Learning*

INTRODUCTION

The process of classification is used to construct a model which helps to describe data classes. Classification is a process of the supervised machine learning algorithms. The objective of the classification model is to describe and distinguishes data classes. In classification, two sets are more important such as training set and testing set. The training set is used to build a model with the training data. Testing set is applied to the classification model and used to check the accuracy. The goal of the classification is to make a classifier based on some cases with some attributes to describe the objects or one attribute to describe the group of objects.
In India there are several agriculture crop productions and those crops depends on the various kinds of factors such as biology, economy and also the geographical factors. Applying such methodologies and techniques on historical yield of various crops, it is possible to obtain information or knowledge which can be helpful to farmers and government organizations for making improved decisions and for make better policy which help to improve production. In this research work, the main focus is on the application of data mining techniques which is used to extract knowledge from the agriculture data to estimate better yield.
In this dissertation, a current development in machine learning is discovered for classification problem. The objective of this dissertation is to classify the crops and solution to increase their yields using classification algorithms

PROBLEMDESCRIPTION

Nowadays, farmers are struggling to produce the yield because of unpredictable climatic changes, decrease /

increase in rainfall and drastically decrease in water supply. So that an agricultural data has been collected, stored and analyzed for useful information. It is used to promote new advanced methods and approaches such as data mining that can give the information of the previous results to the crop yield estimation.
The analysis of a huge set of agriculture data is the major challenge in the agriculture and analyzed for useful information classify the agriculture crops based on temperature changes and rainfall received range. The relevant features are selected and the crops are classified based on location. In this research work, the crop yield is estimated, and the most excellent crop can be chosen by analyzing the climatic changes with the previous yeardata.
The climatic changes for the present year can't be known to overcome this problem, sensors are placed to find the temperature and rainfall received data's. The cloud AWS
interacted with Raspberry Pi in storing the captured values for analyzingpurposes.

I. ID3 ALGORITHM

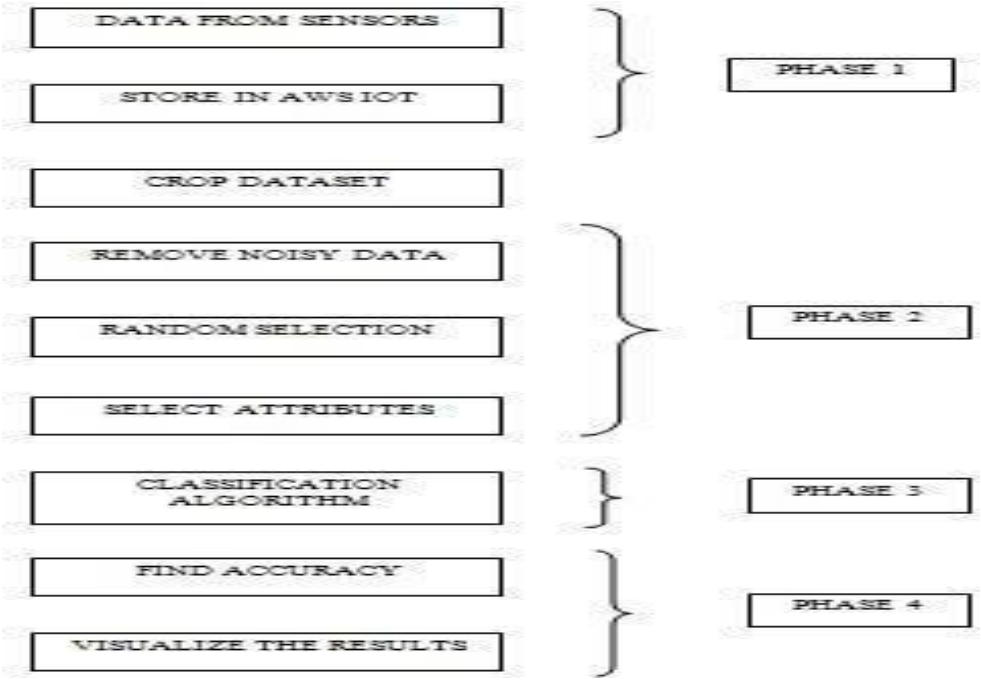

Figure 1: Classification Block Diagram

In decision tree learning, ID3 (Iterative Dichotomiser 3) is an algorithm used to generate a decision tree from a dataset. ID3 is the precursor to the C4.5 algorithm, and is typically used in the machine learning and natural language processing domains. The ID3 algorithm it takes rainfall receives for the respective season as the root node. The entropy (or information gain) can be calculated on each iteration of the algorithm, during this process every unused attribute are used for the construction of tree. Next the process will select the attribute which has the smallest entropy (or largest information gain) value. The selected attributes are grouped and form a set to produce subsets of the data. The decision tree is constructed with each non-terminal node (internalnode - temperature, season) representing the selected attribute on which the data was split, and terminal nodes (leaf nodes - crop) representing the class label of the final subset of thisbranch.

3.1. Information Gain

The information gain IG can be measured as
[IG(T,a)=H(T)-sum_{vin vals(a)}frac{|{textbf{x}in T|x_a=v}|}{|T|} cdot H({textbf{x}in T|x_a=v})]
The information gain measures the *difference* between the entropy *before the split*, and the weighted sum of the entropies *after the split.*

3.2. IG in R

InformationGain <- function(tble) { tble <- as.data.frame.matrix(tble)
entropyBefore <- Entropy(colSums(tble)) s <- rowSums(tble)

entropyAfter <- sum (s / sum(s) * apply(tble, MARGIN = 1, FUN = Entropy))
informationGain <- entropyBefore - entropyAfter return (informationGain)
}

DATASET

The agriculture database contains details about the crop growth of previous years with climate and rainfall details. This data set contains number of attributes such as state of India, district of respective state, crop year, season, annual rainfall received on the corresponding season, minimum and maximum temperature during that season and crop get cultivated. The crop production data set was referred from data world website. The crop production for the duration between 1997 and 2011 was maintained in the dataset. As per the climatic changes, the crop cultivation changes from season to season. By analyzing all those previous year crop production data, choosing a crop as per the climatic changes can bepredicted.

EXPERIMENTALRESULTS

5.1 Predict Temperature

The DHT11 sensor is capable of measuring both temperature and relative humidity and provide fully calibrated digital outputs. Its temperature measuring range is from -40 to +125 degrees Celsius with +-0.5 degrees accuracy. The humidity measuring range, from 0 to 100% with 2-5% accuracy.

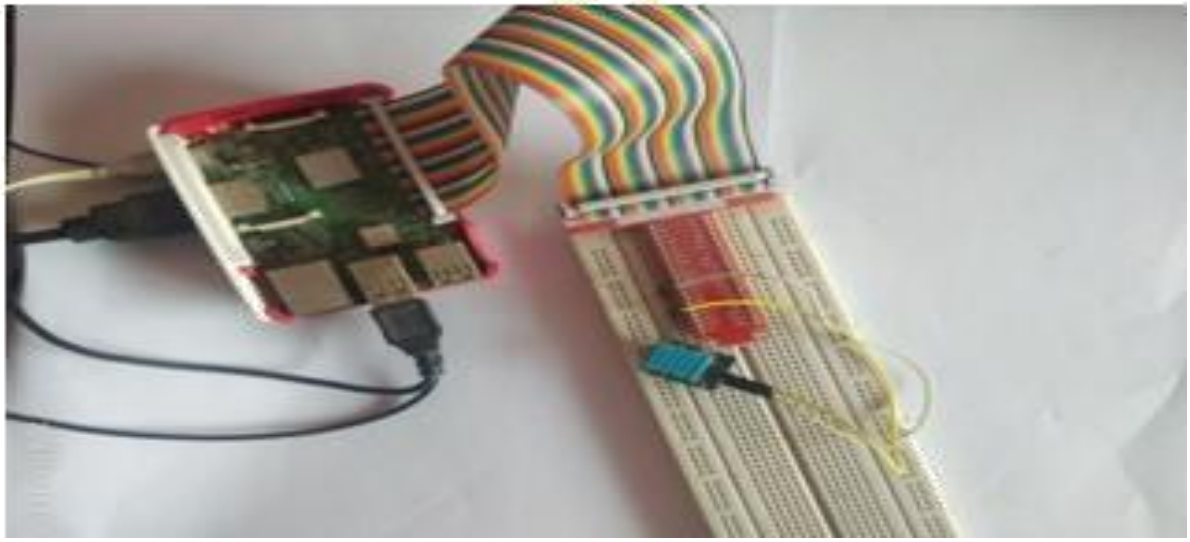

Figure 2: DHT11 Sensor with Raspberry Pi

5.2. Predict RainfallRange

The Soil Moisture Sensor uses capacitance to measure dielectric permittivity of the surrounding medium. In soil, dielectric permittivity is a function of the water content. The sensor creates a voltage proportional to the dielectric permittivity, and therefore the water content of the soil. The sensor averages the water content over the entire length of the sensor. There is a 2 cm zone of influence with respect to the flat surface of the sensor, but it has little or no sensitivity at the extreme edges. It helps to predict three level of soil content (dry soil, humid soil and wetsoil)

Figure 3: Soil Moisture Sensor with Raspberry Pi

5.3. DiscoveringKnowledge

In decision tree learning, ID3 (Iterative Dichotomiser 3) is an algorithm used to generate a decision tree from a dataset. ID3 is the precursor to the C4.5 algorithm, and is typically used in the machine learning and natural language processing domains. The ID3 algorithm begins with the original set as the root node (rainfall). The decision tree is constructed with each non-terminal node (internal node) representing the selected attribute on which the data was split, and terminal nodes (leaf nodes - crop) representing the class label of the final subset of thisbranch.

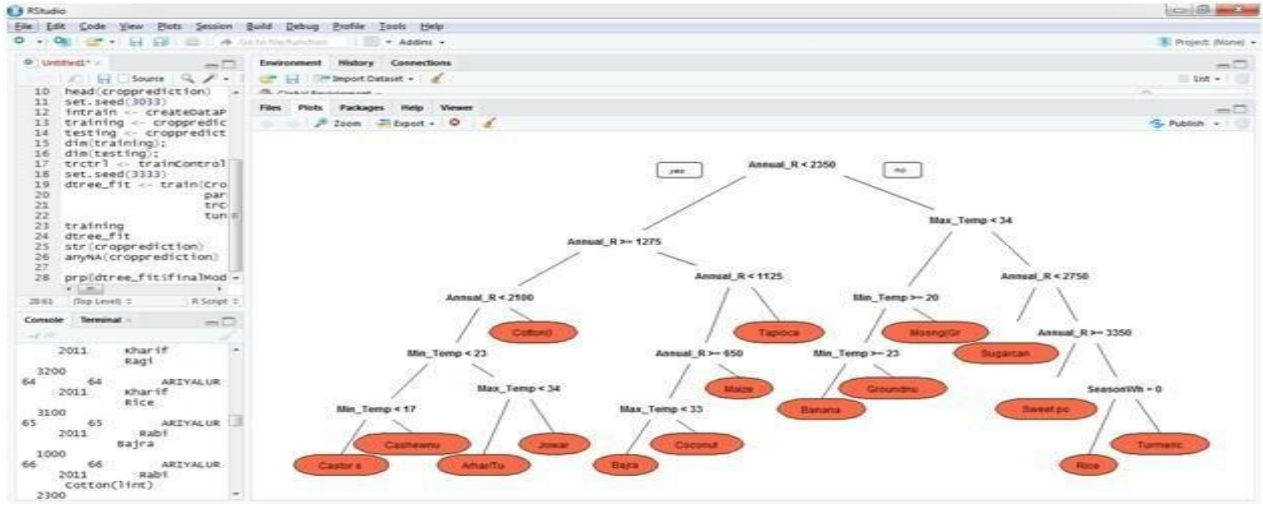

Figure 4 Decision Tree with Crop as a Target Node

II. COMPARATIVERESULTS

Amazon QuickSight is a fast, cloud-powered BI service that makes it easy to build visualizations, perform ad-hoc analysis, and quickly get business insights from huge data. Using cloud-based service user can easily connect to the data, perform advanced analysis, and create stunning visualizations and rich dashboards that can be accessed from any browser or mobile device. Amazon QuickSight also referred as Super- fast, Parallel, In-memory, Calculation Engine (SPICE) uses a combination of columnar storage, in-memory technologies enabled through hardware, machine code generation, and data compression to allow users to run interactive queries on large datasets and get rapidresponses.

The crop get compared with temperature changes and season using Amazon QuickSight.

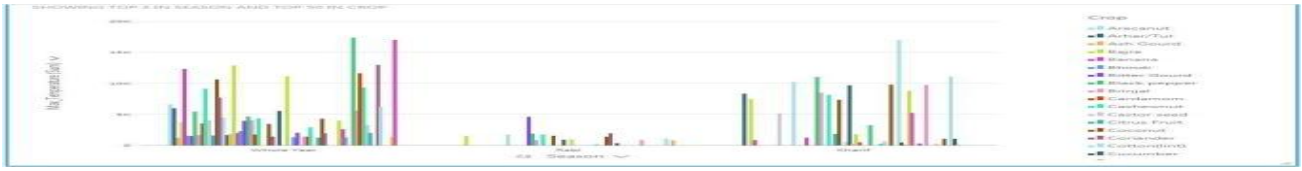

Figure 5 Comparison of season and temperature

III. CONCLUSION

Information mining is the most recent examination area of horticulture. This is sensibly a new examination field and filling in the future is anticipated. These days, ranchers are battling to create the yield due to capricious climatic changes and scope of precipitation. The examinations directed to investigate few characteristics held inside the dataset to choose their viability when contrasted and standard factual procedures. Highlight choice is vital to order the harvest information. In this examination work, choice tree idea was utilized to construct a model in finding an answer of which harvest is better for development. ID3 calculation is utilized to order the harvests and an answer for increment their yield by investigating the climatic changes. This work assists with anticipating the best harvest for breaking down the temperature and precipitation. This will assist ranchers with expanding the yield and pay level. The got precision of ID3 calculation is 95.83 % and it is superior to different calculations.

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