Intelligent Crop Selection using Machine Learning for Precision Agriculture

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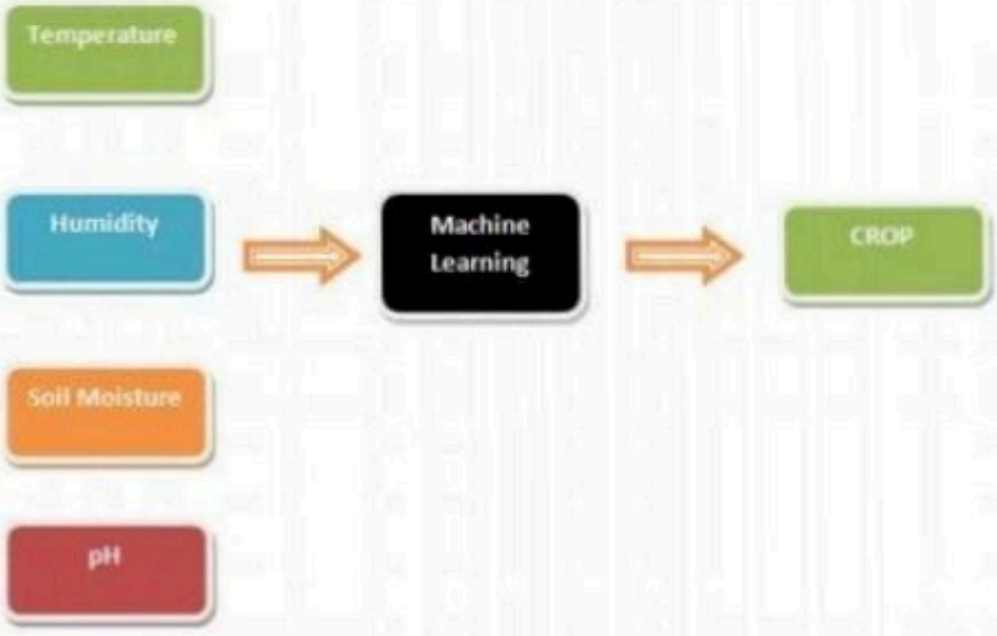
ABSTRACT

- Rainfall received plays a huge role in the growth of crops in agriculture during all stages of crop growth.
- There may be times when the effective rainfall received may not be enough to support crop growth and thus knowledge about it beforehand can help farmers in estimating the amount of water that has to be supplied through irrigation.
- Prediction of effective rainfall and crop water needs is a very challenging task which requires meticulous and scrupulous analysis of a profound list of factors such as temperature and humidity.
- In the past effective rainfall has been computed by taking three major factors into consideration, the humidity, temperature and the received rainfall. Many mathematical models have been proposed over the ages and many of them are still applied to find the effective rainfall.
- In the proposed work, we predict the suitable crop for cultivation based on attributes such as rainfall, temperature, soil moisture, humidity, ph value.

INTRODUCTION

- Weather forecasting and predicting the amount of rainfall that will occur in an area can be very tedious.
- For the purpose of brevity the method considers the factors whose effect is more prominent on the amount of effective rainfall.
- The soil moisture and pH values are considered for suitable crop cultivation.



OBJECTIVES OF STUDY

- The objective of our study is to provide a solution for Smart Agriculture by monitoring the agricultural field which can assist the farmers in increasing productivity to a great extent.
- The proposed system applies machine learning and prediction algorithm like Multiple Linear Regression to identify the pattern among data and then process it as per input conditions.
- This in turn will propose the best feasible crops according to given environmental conditions.

LITERATURE SURVEY

- **TITLE** : "An objective method to modify numerical model forecasts with newly given weather data using an artificial neural network"
- **AUTHOR(S)** : Koizumi K. Weather Forecast
- **PUBLICATION:** IEEE Control and System Graduate Research Colloquium, ICSGRC 2012. 82-87. 10.1109/ICSGRC.2012.6287140.
- **CONCEPT DISCUSSED:**
- An objective method of forecasting precipitation coverage with a neural network is presented. This method uses as predictors all available data at local weather stations including both numerical model results and weather data obtained later than the model initial time, which sometimes contradict each other and hence have to be handled subjectively by well-experienced forecasters. Since the method gives an objective and also realistic forecast of areal precipitation coverage, its skill scores are better than those of the persistence forecast (after 3 h), the linear regression forecasts, and numerical model precipitation prediction.

CONTD..

- **TITLE** : "Long-range monsoon rainfall prediction of 2005 for the districts and sub-division Kerala with artificial neural network"
- **AUTHOR(S)** : Guhathakurta, P
- **PUBLICATION:** Current Science 90:773-779, 2006
- **CONCEPT DISCUSSED:**
- The advantages of artificial neural network technique for explaining the nonlinear behavior between the inputs and output is explored to forecast the monsoon rainfall of 36 meteorological sub-divisions of India. The model uses the past years of monsoon rainfall data only to forecast the monsoon rainfall of coming year. Monthly rainfall time series data for each of the 36 meteorological sub-divisions constructed by Guhathakurta and Rajeevan (2007) is used for the present study. The model captures well the input-output nonlinear relations and predicted the seasonal rainfall quite accurately during the independent period. All India monsoon rainfall forecasts were generated by using area weighted rainfall forecasts of all the sub-divisions. For the first time the idea of up-scaling is introduced in monsoon rainfall prediction using neural network technique and it is shown that up scaling helps to capture the variability of the all India rainfall better. This helps to predict the extreme years like 2002, 2004 better than the neural network model developed based on single time series of all India rainfall. However, derivation of smaller scale (sub-divisions) forecast model may be more useful than the all India forecast.

CONTD..

- **TITLE** : "Modeling inter-annual variation of a local rainfall data using a fuzzy logic technique"
- **AUTHOR(S)** : Halide, H. and Ridd P
- **PUBLICATION:** Proceedings of International Forum on Climate Prediction, 2002, James Cook Universiy, Australia, pp: 166-170, 2002
- **CONCEPT DISCUSSED:**
- The present study investigates the ability of fuzzy rules/logic in modeling rainfall for South Western Nigeria. The developed Fuzzy Logic model is made up of two functional components; the knowledge base and the fuzzy reasoning or decision making unit. Two operations were performed on the Fuzzy Logic model; the fuzzification operation and defuzzification operation. The model predicted outputs were compared with the actual rainfall data. Simulation results reveal that predicted results are in good agreement with measured data. Prediction Error, Root Mean Square Error (RMSE), Mean Absolute Error (MAE) and the Prediction Accuracy were calculated, and on the basis of the results obtained, it can be suggested that fuzzy methodology is efficiently capable of handling scattered data. The developed fuzzy rule-based model shows flexibility and ability in modeling an ill-defined relationship between input and output variables.

DISADVANTAGES

- No interactive system for farmers to predict crop
- Soil moisture is not considered for prediction
- ANN (Artificial neural network) used give less accuracy

PROPOSED SYSTEM

- Proposed model predict crop based on rainfall, temperature, humidity and soil moisture.
- Dataset is pre-processed and converted to numerals before training and prediction
- There are three techniques applied for prediction
- SVM and logistics regression is used.

ADVANTAGES

- Give good accuracy for the considered dataset
- Crop prediction accuracy helps farmers to get better cultivation and yield by using this technique.
- Fertilizer is suggested

REQUIREMENT ANALYSIS

- Computer Aided learning is a rapidly growing dynamic area of research in machine learning industry. The recent researchers in machine learning promise the improved accuracy of perception of crop prediction. Here the computers are enabled to think by developing intelligence by learning. There are many types of Machine Learning Techniques and which are used to classify the data sets.

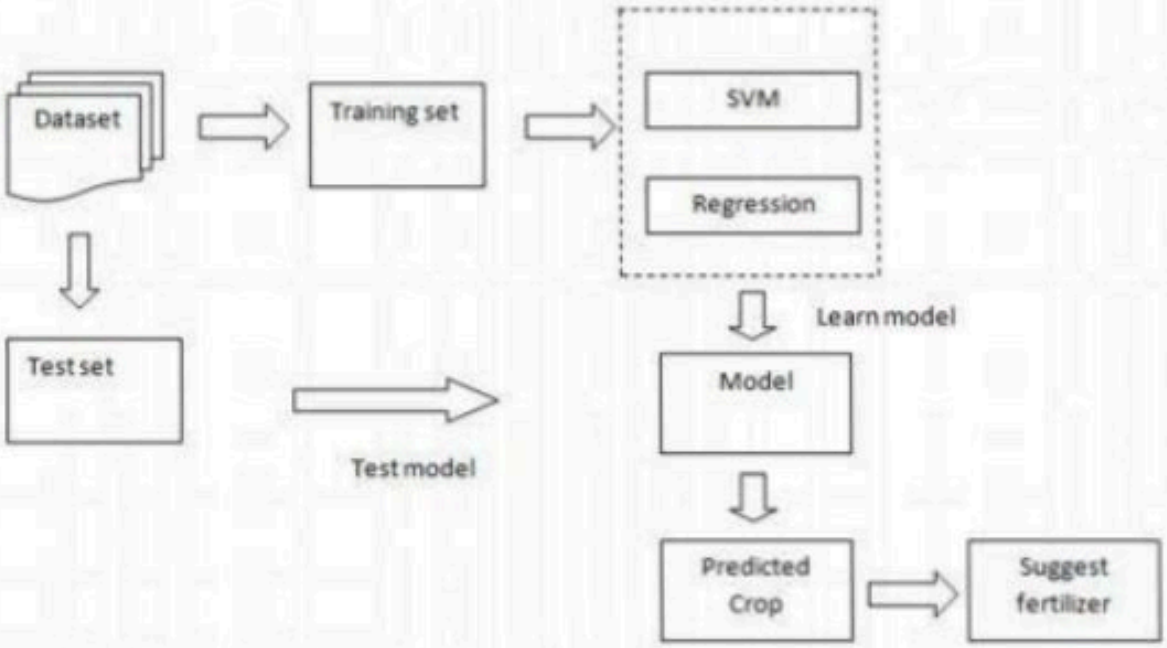
COND..

- **Functional Requirements**
- **Data collection**
- The data collection process involves the selection of quality data for analysis. Here we used dataset with four features namely soil moisture, ph, temperature, humidity and rainfall data. The job of a data analyst is to find ways and sources of collecting relevant and comprehensive data, interpreting it, and analyzing results with the help of statistical techniques.
- **Data visualization**
- A large amount of information represented in graphic form is easier to understand and analyze. Some companies specify that a data analyst must know how to create slides, diagrams, charts, and templates. In our approach, the data histogram and scatter matrix are shown as data visualization part.

REQUIREMENTS

- **Hardware Requirements**
- Processor : Any Processor above 500 MHz.
- Ram : 4 GB
- Hard Disk : 4 GB
- Input device : Standard Keyboard and Mouse.
- Output device : VGA and High Resolution Monitor.
- **Software Requirements**
- Operating System : Windows 7 or higher
- Programming : Python 3.6 and related libraries

SYSTEM ARCHITECTURE



CONCLUSION

- The method was created with the aim to overcome three obstacles. The first one is to find the effective amount of rainfall the second being to use the effective rainfall to find the irrigation water required and third to suggest suitable crop that should be implemented by the farmers to increase crop productivity. The method is successful in all three aspects and in the future it is expected to bring more areas under inspection and also bring more crops into the picture.

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