Enhancement Of Crop Production Using Data Mining And Machine Learning techniques

Sonali sinha[1], Prashant Tiwari[2], Preksha J.W[3], Shalini N[4] , Kushal Kumar B N[5]

[1234]Student, [5]Assitant professor

[12345]Department Of Computer Science And Engineering

[12345]KS Institute Of Technology,Bengaluru - 560062, Karnataka,India

Abstract:Currently India is facing a huge population crisis, the current population is 133.92 crore and there are predictions that India will be adding 273 million more by 2050, which will eventually make the population of the country 161 crores. Providing food security to every individual will become the challenging task and it will increase a lot more pressure on farm lands to grow more crops. But the agriculture land is decreasing at a rate of 30,000 hectares per year.Which means farmers are giving up on their agricultural land and the primary reason behind this is significant drop in the yield eventually translating into low revenue.The poor yield can be attributed to many factors such as climate change, change in the nature of soil and farmers not well equipped with information to adjust their methods to changing conditions.There is a need to make a platform which can help our farmers to take right decision on field and not to confuse them with lots of information.

*Index Terms:*ANN ,RNN ,SVM, Activation function , Optimizer, Encoding, Angular 8 , Django , Tensorflow 2.0.

I INTRODUCTION

Population crisis and farmers giving up on their land is directly posing a threat to the food security of every individual.Whereas agriculture is also the major source of indian economy.But due to climate change there is a lot of shift in the ingredients which plays a vital role in crop production,like soil texture,water quality,seed quality, air temperature etc.

Farmers being unaware of these basic needs of the crop or being overwhelmed with lots of information over the net end up getting confused.Resulting in reduced crop production,low revenue and poor living conditions compelling farmers to give up on their land.

It is generally accepted that successful businesses thrive by consistently making better decisions than their competitors, and the agriculture industry is no exception.

Crop production plays a critical role in food security , and ML is radically improving the way farmers contribute on this front.

Farmers make hundreds of complex and interconnected decisions every year that impact their risk, sustainability, and business returns. Using ML-enabled applications, farmers can now have the means to predict harvest yields and evaluate crop quality, identify plant species, and detect crop disease and weed infestations in ways that were previously impossible.

Through the application of ML technology, a farmer can log into a customized dashboard on a computer or tablet and access an Approximate assessment of the yield on any type of land.

Digital identification of plant species saves farmers time, allowing them to increase productivity in other critical areas.

ML-driven models allow farmers to rely upon digital tools to access the specific information about the particular crop without being confused.

II LITERATURE SURVEY

2.1 Agriculture Analysis Using Data Mining And Machine Learning Techniques[1]

In this Paper ,they used some of the common data mining techniques in the field of agriculture. Some of these techniques, such as the k-means, k nearest neighbor, SVM, and bayesian network are discussed and an application in agriculture for each of these techniques is presented.

2.2 Soil Analysis and Crop Fertility Prediction [2]

Our system will analyze the soil parameters and nutrients present in soil like NPK which will help to determine the fertility level of that soil. Along with soil analysis our system will also predict the crops. System will also suggest a list of fertilizers for that crop according to NPK values. Farmers can test the soil multiple times during the cultivation process and take necessary precautions to get good yield. At the end reports will be generated so farmers can keep record of their fertility.

2.3 Soil Analysis and Prediction of Suitable Crop for Agriculture using Machine Learning [3]

In this paper the soil parameters and nutrients present in the soil like NPK are analyzed to determine the fertility level of that soil. The soil analysis system also predicts the crops using machine learning. It compares the present data and existing data collected from the Department of Horticulture and agriculture according to the different parameters like pH, EC, moisture, temperature values. Farmers can test the soil multiple times during the cultivation process and take necessary precautions to get good yield. At the end reports will be generated so farmers can keep record of their fertility

2.4 Analysis of Soil Behaviour and Prediction of Crop Yield using Data Mining Approach [4]

In this paper they are talking about how soil behaviour is related to crop production with the help of data mining algorithms.

2.5 Machine learning approach for forecasting crop yield based on climatic parameters[5]

In this paper they have taken certain parameters like cloudy days, rainfall, min temperature, to predict the yield of a crop.

2.6 ANALYSIS OF CROP YIELD PREDICTION USING DATA MINING TECHNIQUES [6]

In this paper they created a user friendly interface for farmers which gives the prediction of rice based on the available dataset. '

III DESIGN AND IMPLEMENTATION
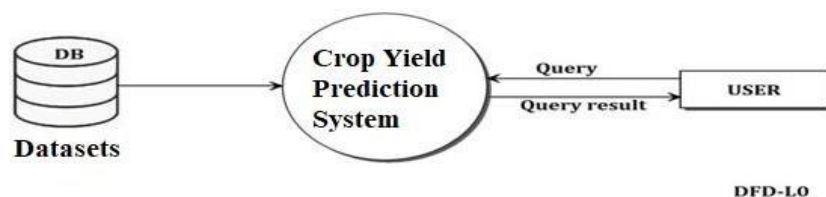
Diagram:

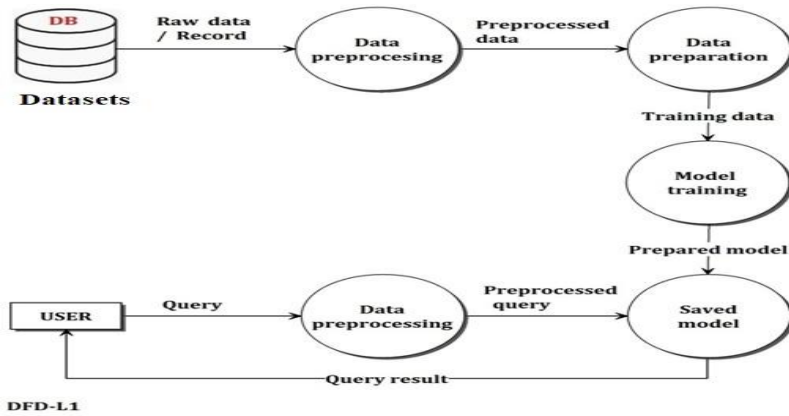Fig.1: data flow diagram of data collection
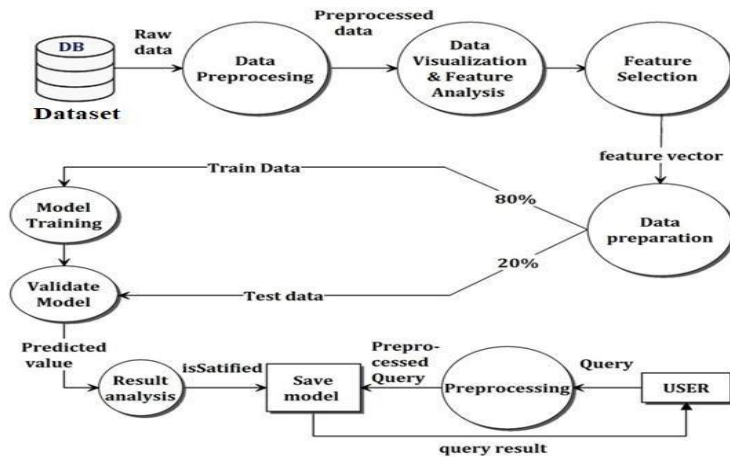
Fig 2: data flow diagram of pre-processing

Fig. 3: data flow diagram of Analysis and Prediction

Tensorflow 2.0 : TensorFlow is an end-to-end open source platform for machine learning. It has a comprehensive, flexible ecosystem of tools, libraries and community resources that lets researchers push the state-of-the-art in ML and developers easily build and deploy ML powered applications.

Neural network: A neural network is a series of algorithms that endeavors to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates. In this sense, neural networks refer to systems of neurons, either organic or artificial in nature.

Encoding: Encoding is the process of converting data from one form to another. While "encoding" can be used as a verb, it is often used as a noun, and refers to a specific type of encoded data. There are several types of encoding, including image encoding, audio and video encoding, and character encoding.

Activation Function: The activation function of a node defines the output of that node given an input or set of inputs. A standard integrated circuit can be seen as a digital network of activation functions that can be "ON" (1) or "OFF" (0), depending on input.

Optimizer: Optimizers are algorithms or methods used to change the attributes of your neural network such as weights and learning rate in order to reduce the losses.Optimization algorithms or strategies are responsible for reducing the losses and to provide the most accurate results possible.

Loss Function: A loss function or cost function is a function that maps an event or values of one or more variables onto a real number intuitively representing some "cost" associated with the event.

Software Requirement:

1. **Anaconda navigator:**Anaconda Navigator is a desktop graphical user interface (GUI) included in Anaconda® distribution that allows you to launch applications and easily manage conda packages, environments, and channels without using command-line commands.

2. **Angular 8 :** AngularJS is a structural framework for dynamic web apps. It lets you use HTML as your template language and lets you extend HTML's syntax to express your application's components clearly and succinctly. AngularJS's data binding and dependency injection eliminate much of the code you would otherwise have to write.

3. **Django:** Django is a high-level Python Web framework that encourages rapid development and clean, pragmatic design. Built by experienced developers, it takes care of much of the hassle of Web development, so you can focus on writing your app without needing to reinvent the wheel. It's free and open source.

4. **Collaboratory:** Colaboratory, or "Colab" for short, is a product from Google Research. Colab allows anybody to write and execute arbitrary python code through the browser, and is especially well suited to machine learning, data analysis and education.

ALGORITHMS

1. **ANN:**An artificial neural network (ANN) is the piece of a computing system designed to simulate the way the human brain analyzes and processes information. It is the foundation of artificial intelligence (AI) and solves problems that would prove impossible or difficult by human or statistical standards. ANNs have self-learning capabilities that enable them to produce better results as more data becomes available.

2. **RNN:** A recurrent neural network (RNN) is a type of artificial neural network commonly used in speech recognition and natural language processing (NLP). RNNs are designed to recognize a data's sequential characteristics and use patterns to predict the next likely scenario.

3. **SVM:** In machine learning, support vector machines (SVMs, also support vector networks) are supervised learning models with associated learning algorithms that analyze data used for classification and regression analysis.A Support Vector Machine (SVM) is a discriminative classifier formally defined by a separating hyperplane.

SCREENSHOTS

Fig 4 FORM

Fig 5 Rice testing
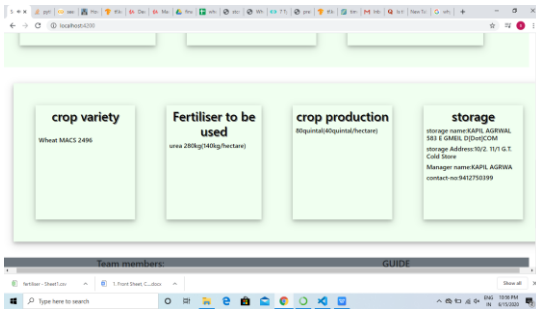

Fig 6 Rice Result

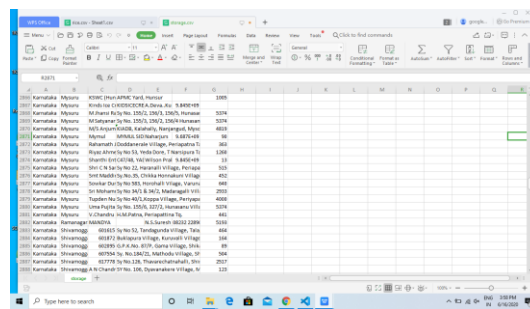Fig 7 Wheat testing

Fig 8 wheat Result
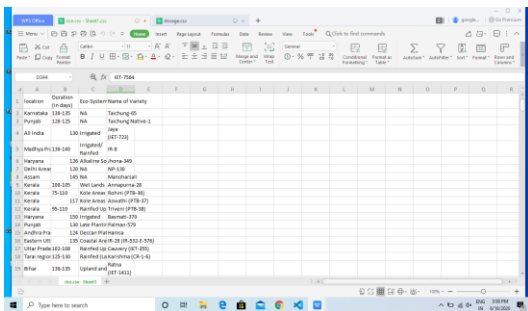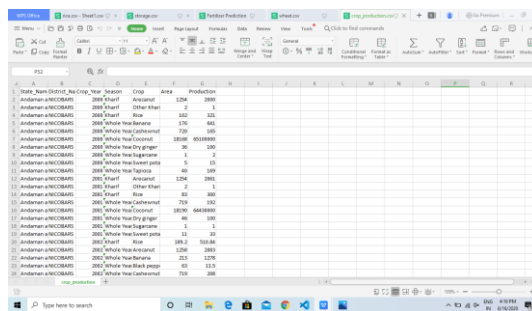

Fig 9 Storage dataset

Fig 10 Rice dataset

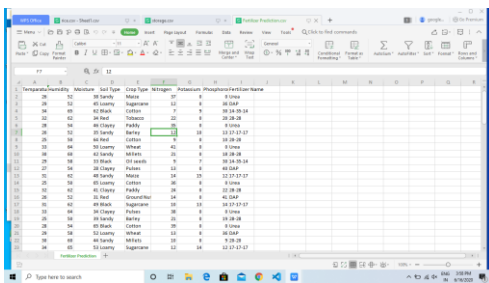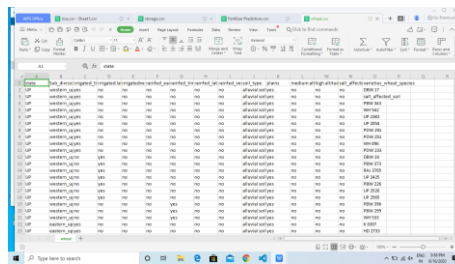Fig 13 Crop production

Fig 11 Fertilizer dataset

Fig 12 wheat dataset

IV CONCLUSION

The study described in this paper proposes a combination of model which aims at improving the farm production by using the techniques of data mining and machine learning and not to confuse farmers with lots of unnecessary information.

V REFERENCES

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