Soil and weather analysis for crop prediction using deep learning

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***Abstract*—Crop yields are critically dependent on weather. A growing empirical literature models this relationship in order to project climate change impacts on the sector. We describe an approach to yield modelling that uses a semiparametric variant of a deep neural network, which can simultaneously. Agriculture is one of the major and the least paid occupation in India. Deep learning can bring a boom in the agriculture field by changing the income scenario through growing the optimum crop. This project focuses on predicting the yield of the crop by applying various Deep learning techniques. The outcome of these techniques is well accurately. The prediction made by Deep learning algorithms will help the farmers to decide which crop to grow to get the maximum yield by considering factors like temperature, rainfall, area. And also, in this project we use Deep learning-based algorithm as Convolution Neural Network.**

***Keywords*—CNN algorithm, deep learning, crop prediction, supervised learning, smart farming, high yield.**

I. INTRODUCTION

The principal means of subsistence and a key contributor to the expansion of the world economy are agriculture. The majority of emerging nations' economies are based mostly on agriculture. In India, agriculture contributes to the economy more than any other sector, accounting for 13.05% of the country's total GDP and supporting around 55% of all households. About 60.3% of the land area in India is used for agriculture. In this study, the state of Rajasthan is taken to start at 27° 23' 28.5972" N and finish at 73° 25' 57.4212" E. Agriculture employs 65% of the population in Rajasthan state and generates about 25% of the state's GDP. 75% of the land is rain-fed, and the remaining 17% is used for agriculture.

Different effects of climate change on agriculture will be seen around the world. The impact of climatic changes on agriculture is difficult to predict because there could be many different outcomes. Changes in temperature and rainfall patterns will be impacted by climate change, and the increase in CO2 levels is most likely to have a large effect on world agriculture. The optimal geographical regions for the production of important staple crops may alter due to climate change.

Crops can be planted earlier thanks to rising temperatures, especially in the spring.

The productivity of crops may be impacted by the rising levels of CO2 in the environment. Several crop species react to CO2 levels differently. soybeans, canola, wheat, and a variety of pasture

II. RELATED WORK

Agricultural deep learning is a new technology ;where a large number of researches have been done wth the technologies imposing in field of agriculture using deep learning.in deep learning where the systemiscapableoflearningbyitselfwithoutspecifiedanypro gramming so it improves machine efficiency by sensinganddescribingdrivedataconsistencyand pattern.Deep learning can be classified into 3 types based onthelearningtechniques– supervisedlearning,unsupervisedlearning,andrecurrentlear ning.

ArunKumar&et al.,"Efficient Crop Yield PredictionUsing Machine Learning Algorithms" [1], In this study, theclassification of crop yields was performed to batch usingArtificial neural networks based on yield productivity. Anditwilldefinetherangeofproductivity.Regression iscarried out to obtain the real crop yield and the expectedcost.NithinSingh&saurabhchaturvedi,"Weatherfo recastingusing machinelearning"[2]isconsiderforcollectinghistoricalweat herdatafromvariousweatherstations to forecast weather conditions for future. AakashParmar&MithilaSompura,"Rainfallpredictionusing Machine Learning Techniques" [3] is taken into account togettheknowledgeinpredictingtheweatherforcroppredictio n.Sachee Nene & Priya,"Prediction of Crop yieldusing Machine Learning" [4], to know about the predictioncropwithrespecttoatmospheric&soilparameters. RameshMedar&AnandM.Ambekar,"SugarcaneCroppredi ctionUsingSupervisedMachineLearning"[5],isconsidered in order to get to predict the unique crop byapplying descriptive analytics using three datasets like asSoildataset,Rainfalldataset,andYielddatasetasacombined dataset.AndrewCraneDroesch,"Machinelearningmethodsf orcropyieldpredictionandclimatechange impact assessment inagriculture" [6], is proposedsemi parametric variant of a deep neural network modelforcroppredictionandevaluatetheeffectsofclimatecha nge. Vinita Shah & Prachi Shah, "Groundnut PredictionUsingMachineLearningTechniques"[7],istakens oil,environmentandabioticattributesforpredictingthegroun dnutyieldusingdifferentMLalgorithms.Theaccuracyofthepr edictionwascomparedusingRMSE.Renuka &Sujata Terdal, "Evaluation of Machine Learning Algorithms for Crop Prediction"[8], deals with estimationofcropyieldfromprecipitationandsoilinput.Forpr ediction,supervisedlearningalgorithmswereused. Thealgorithms were compared using MSE for finding an optimalcrop prediction. P. Vinciya, Dr. A. Valarmathi, "AgricultureAnalysisforNextGenerationHigh Tech Farming in Data Mining" [9], discuss MLR method for analyzing crops anddecision tree algorithm for classification of more than 350data.Itclassifiesrealestate,organicand inorganicsoiltypes.ShivnathGhosh,SantanuKoley,"Machin e LearningforSoilFertilityandPlantNutrientManagement usingBackPropagationNeuralNetworks"[10], detailed theBackPropagationNetworktoestimatethetesting data.ThehiddenlayersofBackPropagationNetworkresponsi bleforthepredictionofsoil properties. This method provides great accuracy than the usual method.

A. PROPOSEDSYSTEM

Models of this relationship are being used more and more to predict how climate change will affect the sector. The main goal of this project is to use Deep Learning algorithms to predict crop yield. The weather has a huge impact on crop yields. Models of this relationship are being used more and more to predict how climate change will affect the sector. We talk about a way to model yields that uses a semiparametric version of a deep neural network, which can do more than one thing at once. Agriculture is one of the most important jobs in India, but it is also one of the least paid. Machine learning can change the way farmers make money by helping them grow the best crop. This could lead to a boom in agriculture. This project is all about using different Deep learning techniques to make predictions about the crop yield. The results of these methods are well on the mark. The predictions made by Deep learning algorithms will help farmers decide which crop to grow to get the most yield by taking into account things like temperature, rainfall, and area. We also use the Convolution Neural Network algorithm in this project. It provides more accurate results.

B.*DataCollection*

In this project we collect the data as considering factors like temperature, rainfall, area, etc. in existing project has used several algorithms, however they used only less number of factors that influence the yield of any crop prediction. Among the various factors affecting crop yield prediction temperature and rainfall are the most impactful.

C.*Preprocessing data*

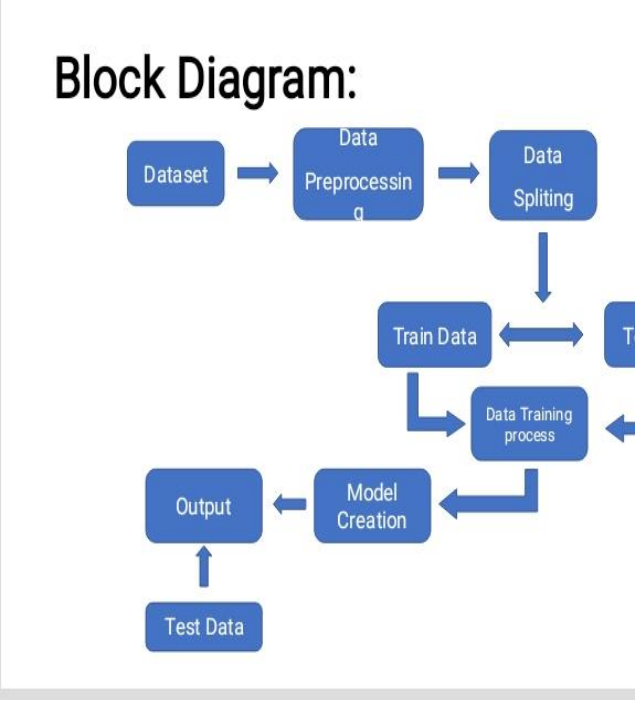
Pre-processing refers to the transformations applied to our data before providing the data to the algorithm. Data Preprocessing technique is used to convert the raw data into an understandable data set. In other words, whenever the information is gathered from various sources it is collected in raw format that isn't possible for the

analysis.

D.Training data and Test data:

For choosing a model we split our dataset into train and test
Here data's are split into 4:1 ratio that means
Training data having 80 percent and testing data having 20 percent
In this split process preforming based on train_test_split model
After splitting we get xtrain xtest and ytrain ytest.

Block diagram:



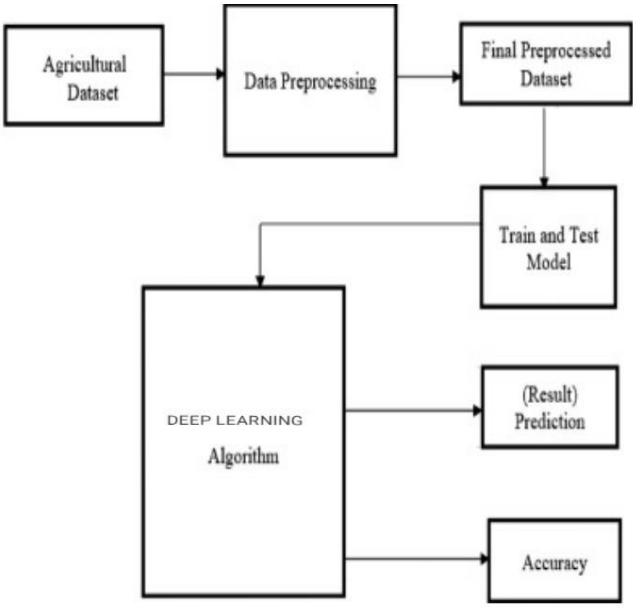
The above diagram shows the detail input and output of the process.

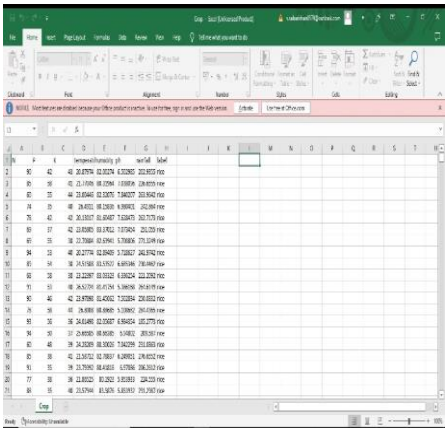
E.Model creation**:**

Contextualise deep learning in your organisation.
Explore the data and choose the type of algorithm.
Prepare and clean the dataset.
Split the prepared dataset and perform cross validation.
Deploy the modelModel.

F.Model Prediction:

Predictive modeling is a statistical technique using machine learning and data mining to predict and forecast likely future outcomes with the aid of historical and existing data. It works by analyzing current and historical data and projecting what it learns on a model generated to forecast likely outcomes. In this Project, our final prediction is to predict which type of crop should be suitable for the land based upon its attributes.





Overview Architecture:

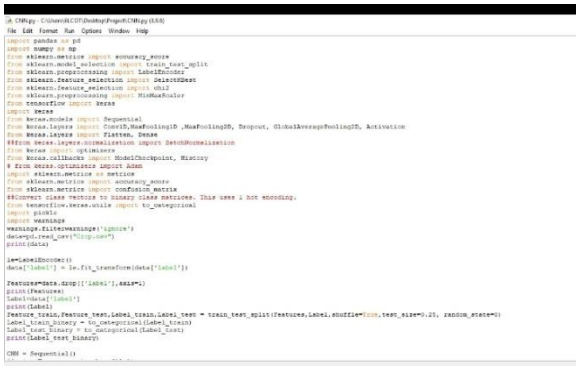
The above diagram shows the overview architecture of the process from start to end.

G.CollectingPrecedingData:

Theprecedingdatacollectionincludesthe nitrogen,phosporuss,potassium,temperature,humidityofair,moistureofthesoil&rainfallforamonthfromtheplatformthatcontainsdataathighaccuracyforexampleweatherstation.Theneedforcollectingthepecedingdatawillbeexplainedinthefollowingsectionandthecollecteddatarepresentedinthesheetasshownin fig.

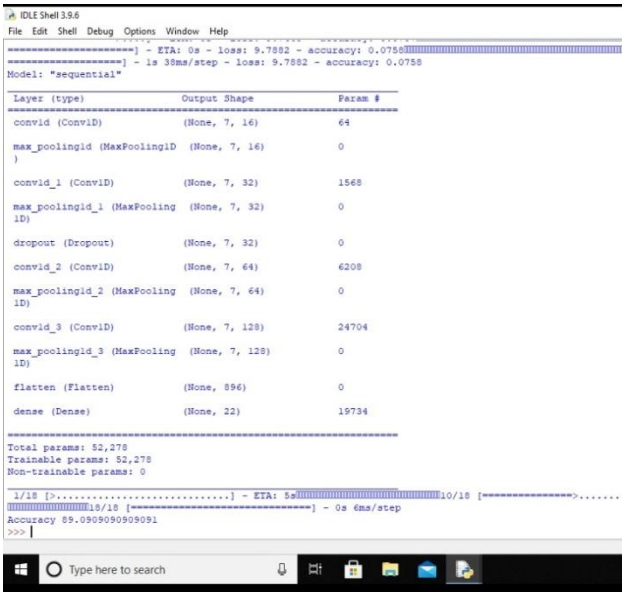
H. Accuracy analysis:

After collecting the data we split the data for testing and training purpose in training data the data is preprocessed and then 80%of data is trained by the CNN algorthim. in this training process we want to give input and output also by the historical data and find the accuracy of thealgorithm.
By using this training process accuracy we a analyze how the testing process give the output.
The following fig shows the accuracy of training data and also the coding for preprocess and training of data.

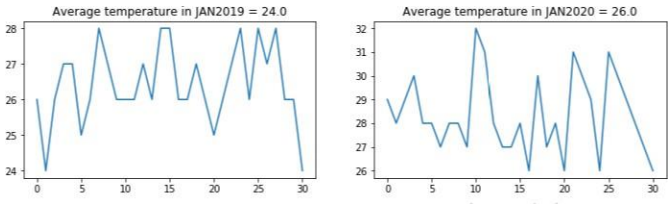


The above figs shows the coding for a training of data and the following figure shows the. output accuracy of this process and also it show how many chance to get good result for our prediction and the prediction success rate of the process by CNN(convolutional nural network) algortihm use of deep learning.

And also the accuracy rate of this algorithm also sohwn in this result of output.



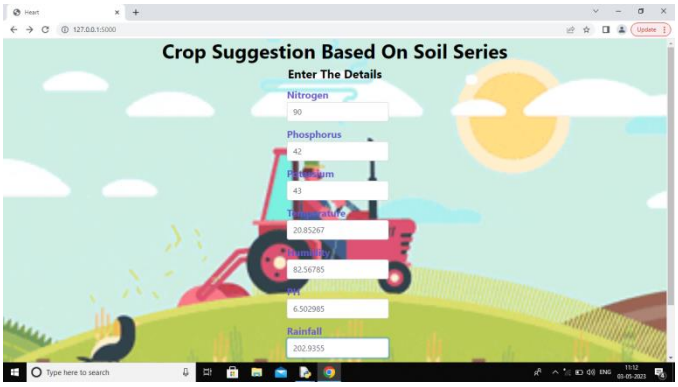
in this training output we got 89% of accuracy it is know as good level of prediction also a high level of accuracy compared to other process.



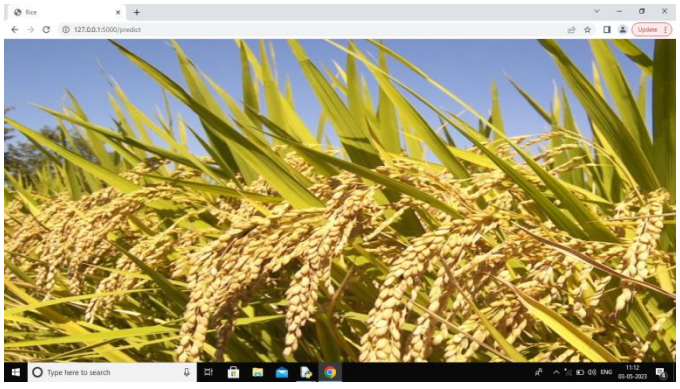
The above diagram shows the temprature variation graph for the temprature prediction for 2 years at same month.

PROPOSEDMETHOD

In CNN method the accuracy of the model is 97%.In order to improve the accuracy deep learnig method is used.deep learning method the accuracy is more high compared to the previous machine learning method and the speed of the result is better than previous method.



INPUT SCREEN FOR ENTERING THE DATAS



RESULT OF THE CROP IN THE OUTPUT SCREEN

CONCLUSION

The proposed supervised deep learning CNN (convolutional neural network) algorithm is developed to predict the crop at high accuracy. Thus, the seed is predicted an output for the given input parameter. This work may greatly help the needy farmerswhohavelessknowledgeinpredictingthecropsfor developingasustainablefuture.Infutureitmay alsoextendtosuggestthefertilizer,suitableguidelinesforc ropland and crops for the given input. In addition, sourceofsunlightandcrophealtharemonitoredatregulari ntervalsand it is also taken into the account for achievingabettercropyield.

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