2021 9th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO)
Amity University, Noida, India. Sep 3-4, 2021

2021 9th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO) | 978-1-6654-1703-7/21/$31.00 ©2021 IEEE | DOI: 10.1109/ICRITO51393.2021.9596339

Analysing the Impact of Climate Change on The Crop Yields of Irrigated Crops and their Water Requirements in India Using Neuro Evolutionary Algorithm

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***Abstract*: Global food security, facing the threat of climate change, is one of the major challenges of the 21st century for sustainability that is already under scrutiny with adequate food security for population growth. Current challenges include water shortages, unaffordable costs due to production and demand, and unpredictable weather conditions. They urged farmers to provide improved farming. In particular, uncertainty about climate change, lack of irrigation facilities, lack of land resources, and lack of crops from traditional farming techniques. In agriculture. Different machine learning techniques such as perception, division, regression, and aggregation are used to predict crops. Artificial networks, vector support systems, linear and linguistic lines, decision trees, and Bayesian intelligence are some of the mathematical methods used to implement the prediction. Obviously, choosing the right algorithm for the sample design algorithms presents a challenge for researchers about the selected plants. In this work, research has been conducted on how many algorithms of machine learning can help predict the dissolution of crops. Methods have been developed to generate predictions. Use machine learning technology in a large computer control system.**

Keywords: Neuroevolutionary algorithm, crop yield, temperature, soil moisture, rainfall, irrigation.

I. INTRODUCTION

In particular, in India, climate change and precipitation are uncertain, consistent with the analysis that the effects of climate change play an important role in crop production. As the climatic conditions are unpredictable in recent years in India, choosing the crop for cultivation is a biggest challenge for farmers. To overcome this problem there is a need of artificial intelligence in agriculture sector where it can help to effectively predict production of crops in various area in india with respect to various climatic condition. Though various crop can be grown in different climatic or temperature condition. Prediction of climatic condition and based on the climatic condition how the growth of crops got affected are analysed. Yields will be analysed in India between 2000 and 2018, entered into the yield database of crops produced in the growing region of India and analysed the rate of change. temperature during this time. However, in South India, the number of dry days through the budding season is increasing significantly, which indicates a variation in the rainfall distribution. South Indian rice, wheat and peanuts have diversified over the years without clear practice (30%). And the annual total amount of cotton [15] of maize in the rain. According to the research, climate change has a special impact on rice production in southern India through changes in rainfall distribution [1]. Climate change has had a major impact on India's water resources, scarcity of food, electricity supply and human health. This research shows an impacts of climate change and adaptation strategies is an area of increasing interest in science. Estimates of crop yield and soil moisture are calculated using parameters derived from a variety of conditions. For a standard drinking water house [10], know about the development of crop products. Climate change, on the other hand, is one of the main factors affecting annual crop production, especially in high-yielding areas where increased irrigation or increased irrigation can increase crop yields, which is environmentally damaging. May increase. When climate change affects groundwater balance, soil erosion and resource dispersal change, resulting in shorter crop growth times than in the future, which can affect water volume. Depending on the latitude and irrigation activity of the region, some regional climates will develop and others will decrease. The results of existing product models suggest that increasing rainfall increases crop yields, and crop yields are more sensitive to rainfall than temperature conditions. If the water supply declines in the future, soils with more water can better reduce the effects of drought. produce. Rising temperatures and fluctuations in rainfall may reduce water supply and crop production in the future. As the irrigated area increases, crop yields increase. However, the quality of food and the environment can be compromised.

II. LITERATURE REVIEW

This work motivates prediction of large Harihu crops in Bishakhapatnam, one of the most expensive regions in Andhra Pradesh. So (MANNs) uses vector regression (SVR) to predict the number of vines that can be harvested using the exact rainfall and the location of the trees. Appropriate agricultural strategies that can be developed to increase - SVR crop yields [4] This paper demonstrates the impact of SVM on yield predictions in the United States. The Indian SVM classification model was tested using the validation

method of factors 3, 4 and 5, which is a method to distinguish one of the predictions of rice farming. Harvested in India between 2000 and 2019. However, It can be improved by reinterpreting the training model taking into account other KFs. Parameters are also to be generated using seed herd optimization. This activity can be studied further by predicting yields for other crops [5]. Product forecasting helps farmers reduce damage and reduce crop yields. The purpose of this work is to analyse environmental parameters such as AUC, annual rainfall and food prices that affect productivity and build relationships among them. this. Regression Analysis is used to analyse environmental conditions and their impact on the product. RA is a multidisciplinary approach that helps you analyse factors, group them into explanatory and responsive variables, and then make a decision. Samples of natural materials such as AR, AUC and FPI were reviewed for 9 years from 2000 to 2019 Linear Regression was used to establish relationships between explanatory variables AR, AUC, FPI. and crop yields as response variables. The value of R2 clearly indicates that the product is highly dependent on AR. AUC and FPI are two other factors that affect crop yield. This survey can be extended by looking at other factors such as Low-Price Support (MSP), Price Index, and Total Price Index (WPI) and the relationship with the yield [7]. This article recommends a support system for rice prediction decision making in Maharashtra, India. That is, low, medium, or high. The list of parameters was calculated using historical data from the study area. The product class is listed as 0.15 to less than 0.60 / ha. Medium at 0.61 to 1.10 / hectare, high at 1.11 to 3. Yield can be predicted using large datasets and models designed for large areas. This provides farmers with guidance to help determine the availability of crops in specific climatic conditions [12].

In addition to the number of flowers and stems, the degree of necrosis of the seeds, the strength of the weed infection, and the variability of the field area, the yield needs to be measured at the field level. potassium deficiency, zinc and sodium deficiency, crop formation and strong resistance to growing season. The predictability of these variables is high, the distance between production and tips, the longer the prediction is less accurate. The deficiency of K and Zn plants is mainly due to soil salinity. Growth time depends largely on the temperature, but on soil characteristics. Due to the high clay density of the topsoil, extended growth cycles, plant similarity in each unit area, and the appropriate K and Zn concentration of the plant are selected [13]19]. Stephan Dreiseit et.al proposed ANN method an undeniably enormous number of information things are gathered regularly, and frequently consequently, in numerous zones of medication. It is a test for the field of AI and measurements to extricate helpful data and information from this abundance of information. Slip-ups in model structure and assessment can have sad outcomes in some clinical applications. Unique consideration should along these lines be taken to guarantee that the models are approved, ideally by utilizing an outside informational index and checking the model's credibility by studying a board of specialists in the space [16][20]. Puneet Srivastava, et al proposed a Soil and Water Assessment Tool (SWAT) and counterfeit neural system (ANN) models in mimicking hydrologic reaction was surveyed in an agrarian watershed in south eastern Pennsylvania. The entirety of the presentation assessment measures including Nash-Sutcliffe coefficient of productivity (E) and coefficient of assurance (R2) propose that the ANN month to month expectations were nearer to the watched streams than the monthly forecasts from the SWAT model. Month to month streamflow E and R2 for the SWAT model alignment phase were 0.54 and 0.57, respectively, and 0.71 and 0.75, respectively, during the ANN model preparation period. These attributes were 0.17 and 0.34 for the SWAT and 0.43 and 0.45 for the ANN model during the approval time frame. [17][18][21].Purnima Shah Smack model execution was influenced by snowmelt occasions during winter months and by the model's powerlessness to enough reproduce base streams. Despite the fact that these and other studies using ANN models suggest that these models provide a suitable alternative for dealing with hydrologic and water quality showing, ANN models are not geographically dispersed watershed exhibiting frameworks due to their momentum structure. Nonetheless, given the fundamental ANN model's promising performance, this investigation suggests that the ANN technique merits additional development in order to unambiguously address the spatial distribution of hydrologic water quality cycles within watersheds.

III. MATERIALS AND METHODS.

A. DATASET

The dataset is collected form Kaggle where it consists of crop production statistics. Cost of production in agriculture data. Rainfall dataset from data.gov.in, cultivation and production data from indiaststst.

B. METHOD

Genetic algorithms can be used in other ways to reverse the prevalence of neural network utilities. Network creation involves arbitrary weights and prejudices. The best networks have made the next generation, set the bell a little quiet and wind down a little. There are many mutagenic methods that can be used in the network during the emergence of emotions. This method works fine, but it doesn't. Depending on the desired function of the neural network, it may be useful to other modifications. It shows you some of the most common ways to change a neural network. Some weights or deviations are multiplied by a random value close to 1. Replaces biases value with a completely new value. There is no direct way to determine how to modify the neural network. Such decisions lead to learning. People often use a variety of conversion methods. This experimental neural evolution framework and algorithm has been replaced by genetic algorithms. The backpropagation technique in neural network has important part in genetic algorithm, that has ability to choose better combination that can fit, therefore to optimize by itself. So there is no reason to choose one based on complexity [19]. Previously, it turned out to be a better pair. The prediction algorithm selects the harvest. Several combinations of mutations are applied and finally derived results are compared [17]. the best result obtained are demonstrated as a result in fig 3.

C. PROPOSED NEUROEVOLUTION ALGORITHM

In neuroevolution various mutation techniques can be applied

Step 1: identifying and collecting relevant Input data.

Step 2: considering the required Features attributes for computation such as Location, Season, etc..

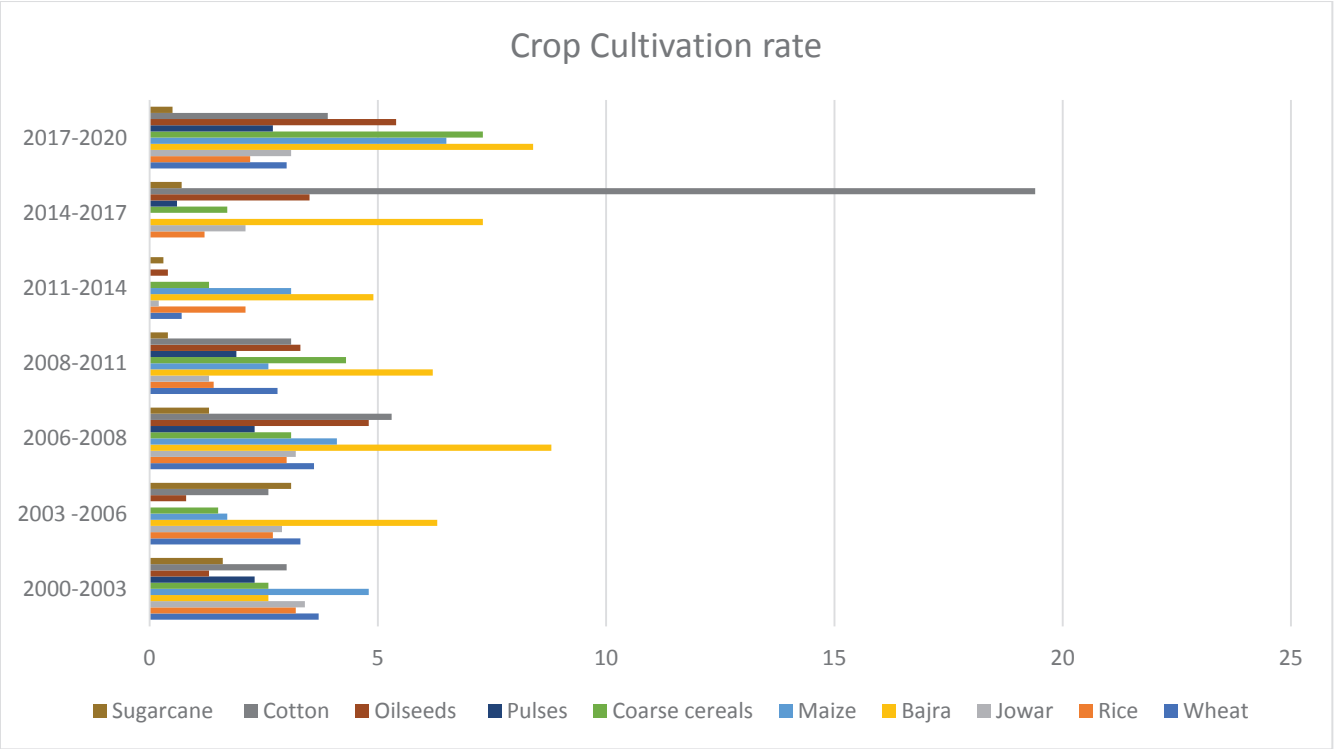

Fig. 1. Crop Cultivation rate in India

Step 3: Construction of neural network (neuroevolution) based on reinforcement learning.

Step 4: Applied mutation to find the fittest neural network.

Step 5: Apply Random values which 1 nearest are considered for multiplying with biases value.

Step 6: substitute new biases value with earlier value.

Step 7: Refine biases values by adjusting the weights.

Step 8: Train the Model

Step 9: Evaluate the Performance using testset.

D. EXISTING ALGORITHMS

The work implements the same analysis using various standard algorithm, therefore to compare the performance of the algorithm.

1) KNN Algorithm

This algorithm finds the similarity between thing that are present in very close proximity. Initially the data are loaded and initialized it to K, where K is the number of neighbours, calculate the distance between the neighbour data, sort the distance collected from smallest to largest. Find the labels for the selected data, Classification returns the K label.

E. SVM Algorithm

It is supervised learning algorithm which is mostly used for classification problems. It helps to plot the data items in n dimension space. Datasets are loaded and regression is applied therefore to predict the type of crop can be yield during the specific seasons.

IV. RESULTS AND DISCUSSION

The Fig 1 depicts the statistics of various crop cultivated in various region during year 2000 to 2019**.** The types of crops include sugarcane, cotton, oilseed, pulses, Coarse cereals, maize, Bajra, Jowar, Rice and wheat. Fig 3 shows that the cultivation of pulses in year 2014 to 2017 is highest than all other crop cultivations. Whereas the cultivation of oilseeds is lowest.

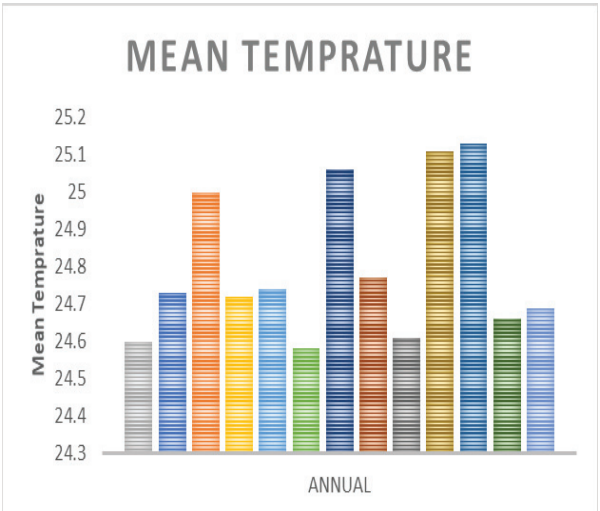

Fig. 2. Mean Temperature during the year 2006 – 2018

Fig 2 shows the mean temperature of various region for the year from 2006 to 2018, as the yield of crop basically depends on the climatic condition the mean temperature is considered for analysing the Maximum crop yield with respect to season and the temperature. It is found that during the year 2015 and 2016 the mean temperature is high only the yield of sugarcane is high whereas all other crop yields such as bajra, oilseed, cotton are all comparatively less. therefore, it shows that temperature condition plays major role in yields.

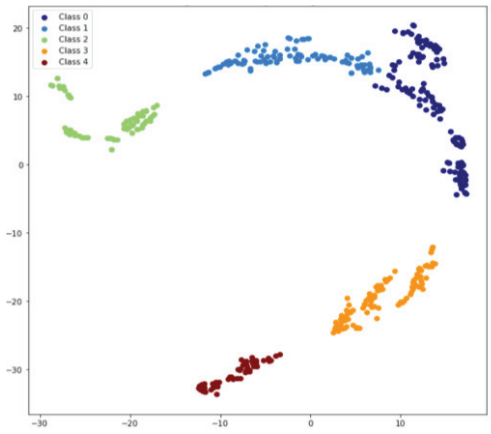

Fig. 3. crops with maximum production in each state

In Fig *3*: crops with maximum production in each state, similarly it shows the classes of crop in various colours accordingly.

a) Agriculture continues to employ the largest labour force in the country. It is one of the main sources of income for millions of people in India. In the past three years, more and more people have poured into this industry in Indian states such as Gujarat, Maharashtra, Haryana and Tamil Nadu. These are the ten largest agricultural states in India, helping to feed millions of people.

Drip irrigation is becoming more and more popular among Indian farmers. Wealthy farmers have also begun to use the latest technology and less labour. This is a necessary change required for Indian agriculture.

V. CONCLUSION

The production crop depends on the features such as soil moisture, PH value of the soil, Slope condition of the field, index of the crop. The work proposed a neuro evolution algorithm for prediction the production of crop and compared the same with various standard algorithm like KNN, SVM. The proposed models result proves to have better result than the standard algorithm. The final components of crop products called PE-2017and NB-2018. Modelling techniques used to predict production using statistical parameters from the data collected. K-NN performance is still sluggish except for PE-2018. Most of the Machine Learning algorithms work to respond to approximately 60% of the nodular yield of the above ground signals. The remaining 40% are affected due to some external factors such as climate change. Also, large databases can use both models to achieve accurate results.

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