CLASSIFICATION OF SOIL AND SUGGESTIONS ON CROPS AND PESTICIDES USING MACHINE LEARNING

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ABSTRACT:

Agriculture is a major source for living for the people of India. Soil is an important key factor for agriculture. There are several soil varieties in India. In order to predict the type of crop that can be cultivated in that particular soil type we need to understand the features and characteristics of the soil type. Machine learning techniques can be used for The suggestions on crops and pesticides. Soil classification involves analyzing various soil attributes which is used for crop recommendation like PH,Nitrogen(N),phosphorous(P) ,potassium(K) values, humidity,temperature and rainfall . This information can then be used to recommend suitable crops for specific soil types based on their requirements and also recommends the pesticides for the crop. For crop recommendation we are using XG boosting algorithm and for the pesticide recommendation we are using CNN algorithm.

Key words: Agriculture,machine learning,soil attributes ,algorithms.

1. INTRODUCTION

Soil is at the bottom of the food chain, yet it is the cornerstone of life on earth. It is critical for terrestrial life: acting as a water filter, nutrient giver, and habitat for billions of organisms that make up a diverse ecosystem. When its healthy, it supplies humans with antibiotics that fight diseases, provides nutrients that feed our crops, and its self-sustaining cycle can regenerate for decades. Crops hold immense significance in global ecosystems, economies, and human societies. Recognizing the multifaceted roles of crops is crucial for advancing sustainable agriculture, enhancing food systems resilience, and fostering equitable and inclusive development for present and future generations. Pesticides are chemical compounds that are used to kill pests, including insects, rodents, fungi and unwanted plants (weeds). Over 1000 different pesticides are used around the world. Pesticides are used in public health to kill vectors of disease, such as mosquitoes, and in agriculture to kill pests that damage crops. They play a crucial role in modern agriculture, helping boost food production and

protect crops to enable higher yields. Pesticides include various disinfectants and antimicrobials that target specific crop damaging weeds, insects, fungi, mites etc.

2. LITERATURE SURVEY

In a research carried out by Leisa J.Armstrong a comparative study of data mining algorithms. They have used a large dataset extracted from the Australian Department of Agriculture and Food(AGRIC) to conduct the research.

In an approach carried out by Jay Gholap carried out a modal to classify the soil based on fertility. The dataset was collected from the soil testing laboratories of Pune District. They have used WEKA tool for developing an automated system.

In a research carried out by V. Rajeshwari a Analyzing Soil Data Using Data Mining Classification Techniques 2016. Soil type is predicted using data mining classification techniques such as J48 . These classifier algorithms are applied to extract the knowledge from soil data and two types of soil are considered such as Red and Black.

3. PROPOSED SYSTEM

The proposed system gives the recommendation of the crop and pesticides. The concept of this paper is to implement the crop recommendations and the pesticides recommendation. In this system The crop recommendation is done by using the soil parameters like nitrogen and it is represented as N , phosphorus is represented as P and potassium is represented as K so that this method helps in solving many agriculture and farmers problems.This improves our indian economy by maximizing the yeild rate of crop production.
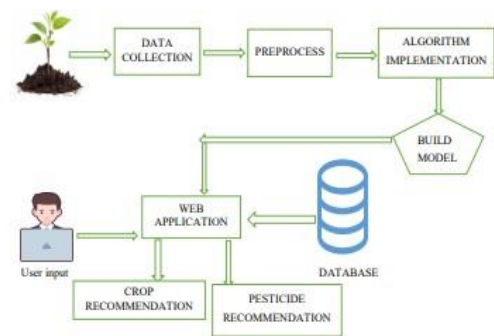

Fig.proposed system

4. ALGORITHMS

XG BOOST : XGBoost is a robust machine-learning algorithm that can help you understand your data and make better decisions.XGBoost is an implementation of gradient-boosting decision trees. It has been used by data scientists and researchers worldwide to optimize their machine-learning models. In machine learning the XGBoost algorithm is an implementation of gradient-boosting decision trees. It has been used by data scientists and researchers worldwide to optimize their machine-learning models.
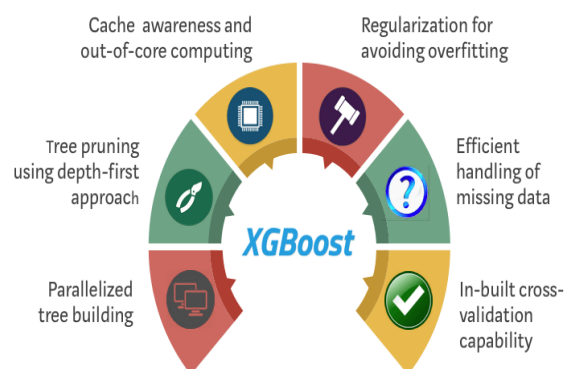

Fig XG BOOST

CNN : Convolutional Neural Networks (CNNs) are a powerful tool for machine learning, especially in tasks related to computer vision. Convolutional Neural Networks, or CNNs, are a specialized class of neural networks designed to effectively process

grid-like data, such as images. A Convolutional Neural Network (CNN) is a type of deep learning algorithm that is particularly well-suited for image recognition and processing tasks. It is made up of multiple layers, including convolutional layers, pooling layers, and fully connected layers The architecture of CNNs is inspired by the visual processing in the human brain, and they are well-suited for capturing hierarchical patterns and spatial dependencies within images.
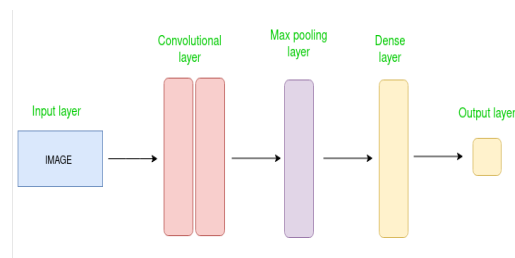

Fig.CNN Algorithm

5. WORKING

Working of the system has some process,firstly we need to collect the data from some remote sites like kaggle this process is called datacollection and then we need to clean the data this process is called preprocessing.The next step is splitting data it involves two types testing and training this is because to evaluate the model.Next step is to build the model this is purely based on the algorithms.training and testing ratio is 80:20 and then evaluate a model this gives the result of the system.now we need to create a web application using programming languages.So users need to open the web page and he needs to give the values of nitrogen,phosphorous,potassium,humidity,temperature and rainfall for crop recommendation for their land.For the pesticide recommendation the users

need to upload the pest which effects their crop For that it gives the pesticides to kill the pest to get good yield production.

Sample crop recommendation data:

N	P	K	PH	TEMP	HUMI	RAINFALL	LABEL
90	42	43	6.5	21	82	202	RICE
50	56	76	7.9	20	19	73	chickpea
57	67	25	7.5	32	66	64	Black gram
40	79	17	6.4	21	63	38	Lentil
38	21	35	5.8	20	89	110	pomegranate
25	129	195	5.7	17	81	72	grapes
70	44	19	5.8	24	73	94	Maize

Sample pests image that effects the crop:

5. RESULTS

The proposed model is based on crop and pesticide database. Several machine learning algorithms are used to recommend the crop and pesticides. The following are the results of the system.

Crop recommendation output:

Pesticide recommendation output :

6.CONCLUSION

In conclusion, crop and pesticide recommendation has demonstrated the effectiveness of employing data-driven algorithms and machine learning techniques in optimizing crop yield and managing pest infestations. Through the analysis of various factors such as soil quality, weather conditions, and pest prevalence, we have developed a robust recommendation system that assists farmers in making informed decisions about crop selection and pesticide usage.

7.FUTURE SCOPE

In future suitable fertilizers are suggested for the well growth of the crop cultivated. The present models deals with available old data whereas the future model contain the real time a data that is directly received from agricultural land that is placed with sensors and by direct capturing the pest in crop.

8. REFERENCES

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