iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** VII **Month of publication:** July 2022

DOI: https://doi.org/10.22214/ijraset.2022.45739

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VII July 2022- Available at www.ijraset.com

Recommendation of Agricultural Crop Based on Productivity and Season Using Machine Learning

Sowmya DM[1], Aliya Sultana Imam Sabh Athar[2], Mubeena Banu M[3], Rakshitha Jain S[4], Divya MS[5]
[1, 2, 3, 4]*UG Students,* [5]*Assistant Professor, Department of Information Science and Engineering, Bapuji Institute of Engineering and Technology, Davanagere, India*

Abstract: ***Many states faces uncertainty in agriculture which decreases its production. With more population and area, more productivity should be achieved but it cannot be reached. Agricultural factors and parameters make the data to get insights about the Agri-facts. Growth of IT world drives some highlights in Agriculture Sciences to help farmers with good agricultural information.***

The common difficulty present among the Indian farmers are they don't opt for the proper crop based on their soil necessities. Because of this productivity is affected. This provides a farmer with sort of options of crops which will be cultivated. Agricultural issues like crop prediction, rotation, water requirement, fertilizer requirement and protection can be solved. To implement such an approach, crops are recommended based on its climatic factors and quantity. Data Analytics paves a way to evolve useful extraction from agricultural database. Crop Dataset has been analyzed and recommendation of crops is done based on productivity and season.

Keywords: Recommender System, Machine Learning and Data Science, Knowledge Discovery in Databases, Decision Tree

I. INTRODUCTION TO AGRICULTURE

Agriculture gave birth to civilization. India is an agrarian country and its economy largely based upon crop productivity. Thus agriculture is that the backbone of all business in India.

Now India stands in second rank in worldwide in farm production. India is an agricultural country but remains using traditional ways of recommendations for agricultural purpose.

Presently, recommendations for farmers are supported one to at least one interaction between farmers and therefore the experts and different experts have different recommendations. Agriculture directly depends on the environmental factors such as sunlight, humidity, soil type, rainfall, Maximum and Minimum Temperature, climate, fertilizers, pesticides etc. Knowledge of proper harvesting of crops is in need to bloom in Agriculture. India has seasons of

1) Winter which occurs from December to March
2) Summer season from April to June
3) Monsoon or rainy season lasting from July to September and
4) Post-monsoon or autumn season occurring from October to November.

Due to the diversity of season and rainfall, assessment of suitable crops to cultivate is necessary.. Farmers or cultivators need proper assistant regarding crop cultivation as now-a-days many fresh youngsters are interested in agriculture.

II. KNOWLEDGE DISCOVERY IN DATABASES

Extracting knowledge from the data set is the process of mining. It aims to give accurate results to farmers. It finds hidden patterns. It discovers useful knowledge from the tremendous data set.

It is one of the processes in Knowledge Discovery in Databases (KDD). Apart from the KDD process, in recent days with the development in IT world, Machine Learning has emerged to handle big volume of data and involves high performance computing too.

Application of Machine Learning in Agriculture peaks up day by day. Recommender systems have lent its hands to users to choose items they like. Recommendation system is the approach to provide the suggestions to the users of their interest. This can be practiced for agricultural use too. Based upon the factors of agriculture, farmers are given with ideas for their cultivation process. New techniques to increase crop cultivation can also be recommended. Pesticides, fertilizers can also be recommended.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VII July 2022- Available at www.ijraset.com

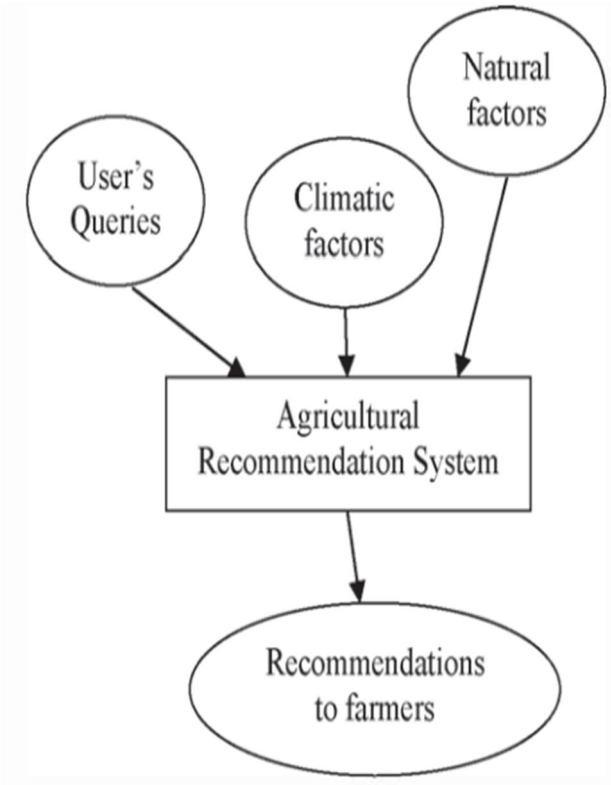


Fig. 1: Agricultural Recommendation

III. RELATED WORK

Tripathy et al., [2] provided a system to have m anagement of pesticides for crop cultivation using data mining process. Essential parameter for agriculture analysis is nature of soil. Diverse varieties of soil are available in this India. Crops are cultivated depending on the type of soil in the land. The role of soil in im proving crop cultivation is discussed [3]. Datamining techniques are applied to analyze the soil parameter.

JRip, J48 and Naive Bayes techniques are applied [4] which produces more reliable results in analyzing red and Black soil. Impact of parameters of agricultural in the crop management is studied to improve productivity [5]. Neural networks, soft computing, big data and fuzzy logic methods are being used to examine the agricultural factors.

Pritam Bose [6] developed a SNN model to have a spatiotemporal analysis with crop estimation. An automatic system to gather the information about soil nature, weather conditions was developed [7] with clustering techniques to extract the knowledge and use it by farmers in crop cultivation. Communicating through ICT bridges the gap among agriculturists e.g., Mobile devices, in today's world shares knowledge quickly. Semantic Web based Architecture [8] with GIS technologies helps farmers to learn about the crop ideas in short span of time. GIS sends data about the climatic conditions and geographic factors.

Crop and Yield Prediction Model suggested by Shreya S. Bhamose [13] used Modified k-means clustering algorithm predicts the amount of harvest of crops and also water requirement for crops. In addition, a disease prediction module is developed for tomato crop which identifies blight disease in tomato and intimates to farmers.

Web based Recommendation system developed by Kiran Shinde [17] assists farmers to choose crops for rotation and proper fertilizers. Multi-tier client-server architecture is used for processing data. Random Forest Algorithm with a rating system is used for crop identification which shows 90% accuracy for the dataset collected. FP-Tree is constructed to know about the possible crops to sow in the field. It takes the yield of crops as input to suggest a proper crop for farmers.

K. He, X. Zhang, S. Ren, and J. Sun present a residual learning framework to ease the training of networks that are substantially deeper than those used previously. They explicitly reformulate the layers as learning residual functions with reference to the layer inputs, instead of learning unreferenced functions. They provide comprehensive empirical evidence showing that these residual networks are easier to optimize, and can gain accuracy from considerably increased depth. They also present analysis on CIFAR-10with100and1000 layers. The depth of representations is of central importance for many

IV. PROBLEM STATEMENT

Agriculture in India plays a predominant role in economy and employment. The common problem existing among the Indian farmers are they don't choose the right crop based on their soil requirements. Due to this they face a serious setback in productivity. To address this problem of the farmers machine learning based crop recommendation system has to developed.

V. ARCHITECTURAL OVERVIEW

This paper shows the Recommendation of Crops based on Productivity and Season. Initially, the Data has to be collected from different areas which includes the dataset like Area of Crop Production, Season of Crop Production, Type of soil etc. In the next step Pre-processing of the collected Data has been done like wrangling of data etc. Then extracting the necessary features from the dataset. After extracting Classification of the Model has been done. The algorithm applied here is the Decision Tree Classifier. Then the model will be trained by taking 80%of the collected dataset. After the trained model has to be tested by applying suitable Regression Analysis to the model. Then properly trained and tested model made available to the farmers for Crop Prediction.

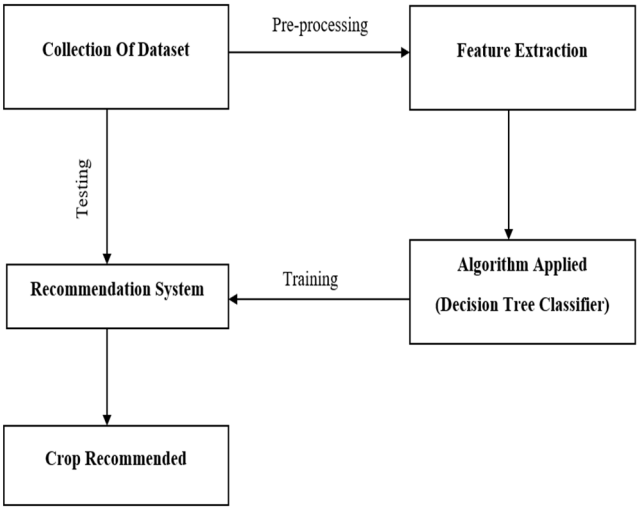


Fig. 2: Block Diagram of Crop Recommendation System.

VI. DATASETS

This is the first real step towards the real development of a machine learning model, collecting data. This is a critical step that will cascade in how good the model will be, the more and better data that we get, the better our model will perform.

The dataset used in this crop recommendation in India taken from some other source.

Dataset:

The dataset consists of 821 individual data. There are 14 columns in the dataset, which are described below.

1) *States:* total number of states in India
2) *Rainfall:* rainfall in mm
3) *Ground Water:* Total ground water level
4) *Temperature:* temperature in degree Celsius
5) *Soil type:* Number of soil types
6) *Season:* Which season is suitable for crops
7) *Crops:* Types of crops
8) *Fertilisers Required*: Types of Fertilisers required
9) *Cost of cultivation:* Total cost for cultivation
10) *Expected revenues:* Total expected revenues
11) *Quantity of seeds per hectare:* seeds for quantity per hectare
12) *Duration of cultivation:* number of day for duration of cultivation.
13) *Demand of crop:* demand of crop (High, low)
14) *Crops for mixed cropping:* which crop can mixed for cropping.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VII July 2022- Available at www.ijraset.com

VII. SYSTEM DESIGN OF CROP RECOMMENDATION SYSTEM

The System Design below shows the overall design of the model. Starting from dataset Collection from different areas then feature extraction of the dataset that is extraction only the required features for training the model the application of the Decision Tree Algorithm, then training and testing of the model, lastly Crop Recommendation System will be developed.

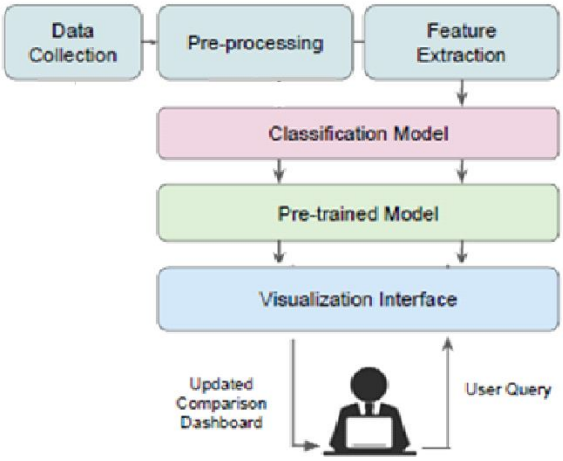


Fig 3: System Design of Crop Recommendation System

	Crop_Year	Season	Crop	Area	Production
0	1997	Kharif	Banana	5619	183740.0
1	1997	Kharif	Horse-gram	6849	3040.0
2	1997	Kharif	Onion	2813	37188.0
3	1997	Kharif	Sesamum	1598	580.0
4	1997	Kharif	Small millets	63	50.0
..	...	...	...	...	...
537	2013	Whole Year	Sugarcane	1170	121181.0
538	2013	Whole Year	Sweet potato	2	42.0
539	2013	Whole Year	Tapioca	340	10174.0
540	2013	Whole Year	Tobacco	100	159.0
541	2013	Whole Year	Turmeric	1203	6472.0

Fig. 4: Data Extraction

VIII. EXPERIMENT RESULTS

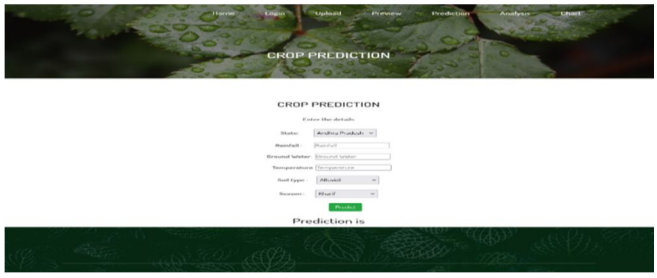


Fig. 5: Crop Recommendation System where the farmer gives the inputs for prediction

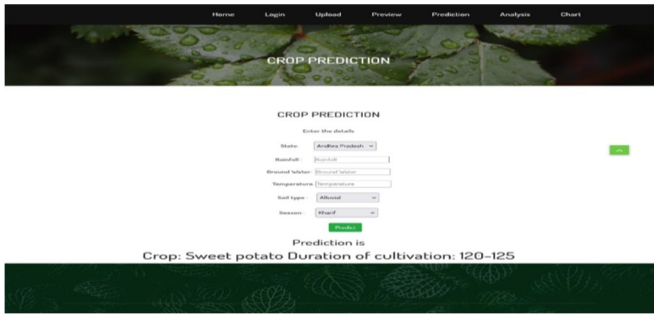


Fig. 6: Crop Recommended that is Potato with duration of cultivation 120-125 days

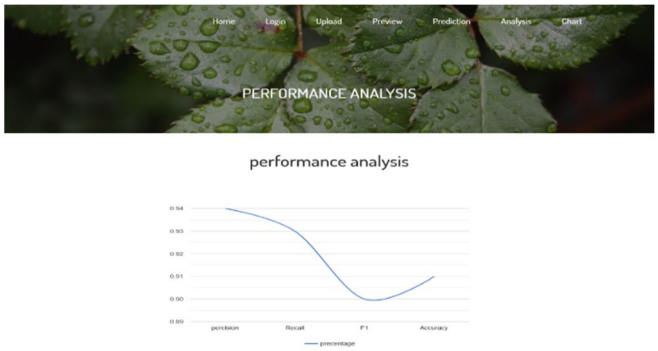


Fig 7: Visualizing the Performance Analysis

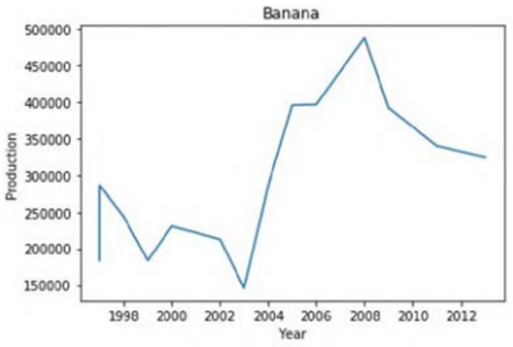


Fig. 8: Measuring the performance of Banana crop

It is clear from the Fig 8 that, production of banana will not lead farmer to any loss. There was a high production in the year of 2008. Comparing 2008, 2012 has little diminished but it was not as low as 1990's. It is clear that banana will give a decent production to the farmers.

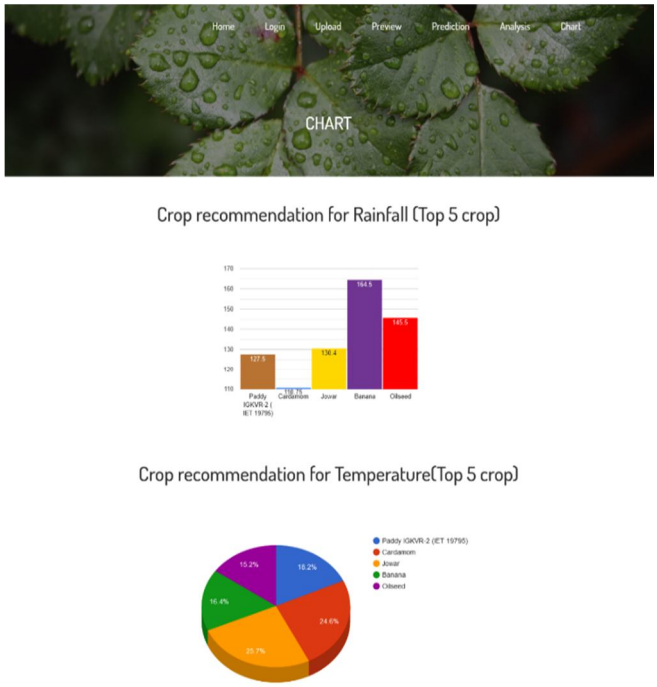


Fig 9: Visualizing Charts for Top 5 crops with respect to Rainfall and Temperature

IX. INCORPORATED LIBRARIES AND PACKAGES

1) Pandas is a Python library used for working with data sets. It has functions for analyzing, cleaning, exploring, and manipulating data. Pandas allows us to analyze big data and make conclusions based on statistical theories. Pandas can clean messy data sets, and make them readable and relevant.

2) Matplotlib is a low level graph plotting library in python that serves as a visualization utility. Matplotlib is open source and we can use it freely.

3) PyTorch is a Python package that provides two high-level features, Tensor computation (like NumPy) with strong GPU acceleration and Deep neural networks built on a tape-based autograd system.

X. PROPOSED SYSTEM

Crop production depends on many agricultural parameters. Proposed work is based on the recommendations given by considering the season of crop production to the farmers. This kind of suggestions will make farmer to know that whether that particular is yielding a good production in recent years. Production of crops may become less due to any crop disease, water problem and many other factors.

Based on this farmer can take decision of trend on crops in recent years. Farmers will be given recommendation by considering the season of crop production. Recommender systems have lent its hands to users to choose items they like. Recommendation system is the approach to provide the suggestions to the users of their interest. This can be practiced for agricultural use too. Based upon the factors of agriculture, farmers are given with ideas for their cultivation process. New techniques to increase crop cultivation can also be recommended.

XI. CONCLUSION AND FUTURE WORK

In this paper, significance of management of crops was studied vastly. Farmers need assistance with recent technology to grow their crops. Proper prediction of crops can be informed to agriculturists in time basis. Many Machine Learning techniques have been used to analyze the agriculture parameters. Some of the techniques in different aspects of agriculture are studied by a literature study. Blooming Neural networks, Soft computing techniques plays significant part in providing recommendations. Considering the parameter like production and season, more personalized and relevant recommendations can be given to farmers which makes them to yield good volume of production.

In the future, collecting all required data by giving GPS locations of a land and by taking access from Rain forecasting system of by the government should be done, we can predict crops by just giving GPS location. Also, we can develop the model to avoid over and under crisis of the food. When the farmers sow a particular crop, there might face some issues or diseases in the crop before harvesting. In that case, they can upload the photographs of the crop and the soil report. Then the AI model can identify the problems and provide them with probable solutions. We can also provide IOT solutions through APIs virtual agents which can help the farmers connect with raw material dealers, who can provide them with the materials required for instance seeds and fertilizers according to the crop recommended to them by the model.

REFERENCES

[1] Shreya S. Bhanose, Kalyani A. Bogawar (2016) “Crop And Yield Prediction Model”, International Journal of Advance Scientific Research and Engineering Trends, Volume 1,Issue 1, April 2016

[2] Tripathy, A. K., et al.(2011) "Data mining and wireless sensor network for agriculture pest/disease predictions." Information and Communication Technologies (WICT), 2011 World Congress on. IEEE.

[3] Ramesh Babu Palepu (2017) ” An Analysis of Agricultural Soils by using Data Mining Techniques”, International Journal of Engineering Science and Computing, Volume 7 Issue No. 10 October.

[4] Rajeswari and K. Arunesh (2016) “Analysing Soil Data using Data Mining Classification Techniques”, Indian Journal of Science and Technology, Volume 9, May.

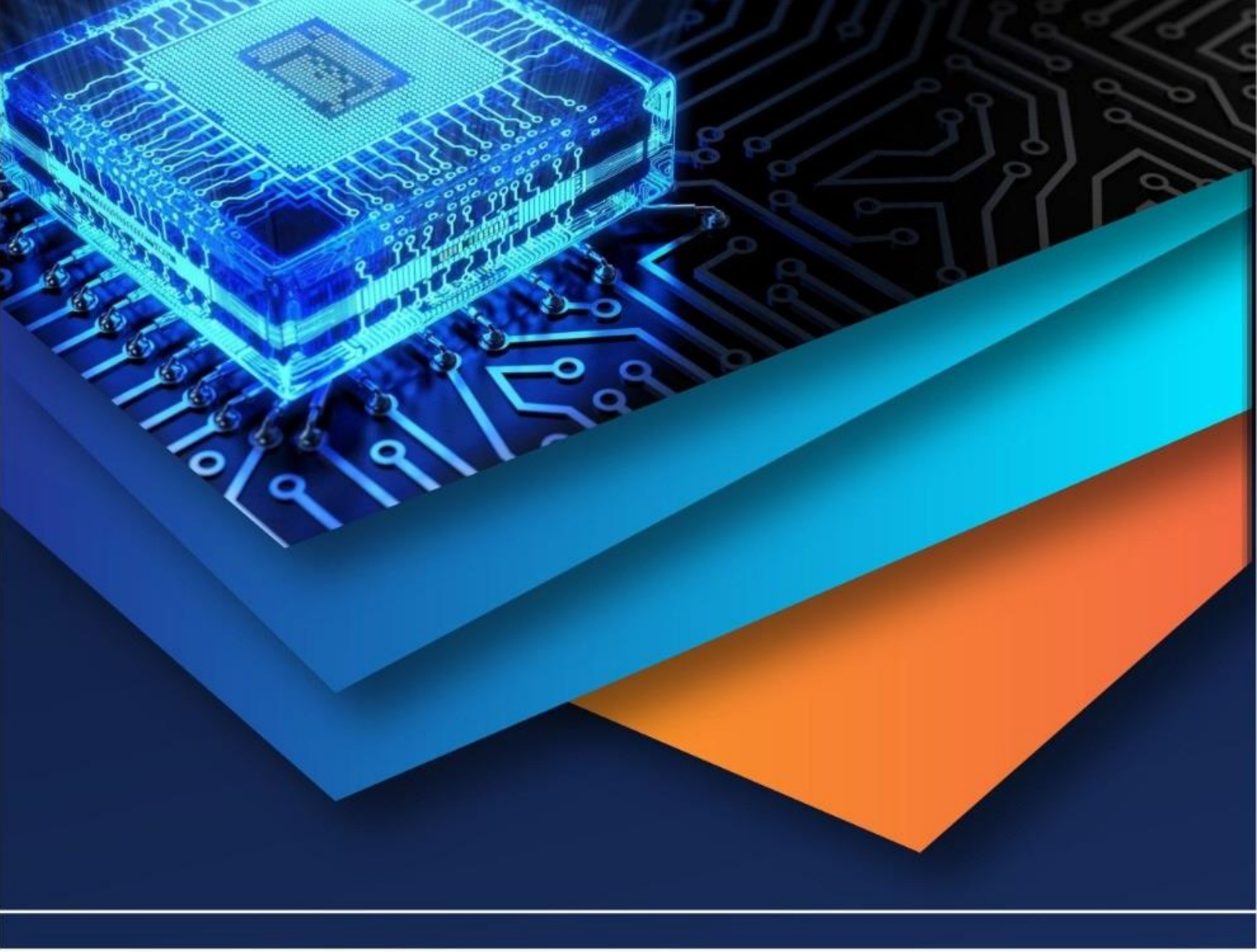
[5] A.Swarupa Rani (2017), “The Impact of Data Analytics in Crop Management based on Weather Conditions”, International Journal of Engineering Technology Science and Research, Volume 4,Issue 5,May.

[6] Pritam Bose, Nikola K. Kasabov (2016), “Spiking Neural Networks for Crop Yield Estimation Based on Spatiotemporal Analysis of Image Time Series”, IEEE Transactions On Geoscience And Remote Sensing.

[7] Priyanka P.Chandak (2017),” Smart Farming System Using Data Mining”, International Journal of Applied Engineering Research, Volume 12, Number 11.

[8] Vikas Kumar, Vishal Dave (2013), “KrishiMantra: Agricultural Recommendation System”, Proceedings of the 3rd ACM Symposium on Computing for Development, January.

[9] Savae Latu (2009), "Sustainable Development : The Role Of Gis And Visualisation", The Electronic Journal on Information Systems in Developing Countries, EJISDC 38, 5, 1-17.
[10] Nasrin Fathima.G (2014), "Agriculture Crop Pattern Using Data Mining Techniques", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, May.
[11] Ramesh A.Medar (2014), "A Survey on Data Mining Techniques for Crop Yield Prediction", International Journal of Advance Research in Computer Science and Management Studies, Volume 2, Issue 9, September.
[12] Shakil Ahamed.A.T.M, Navid Tanzeem Mahmood (2015)," Applying data mining techniques to predict annual yield of major crops and recommend planting different crops in different districts in Bangladesh", ACIS 16th International Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing (SNPD),IEEE,June.
[13] Shreya S.Bhanose (2016),"Crop and Yield Prediction Model", International Journal of Advence Scientific Research and Engineering Trends, Volume 1,Isssue 1,ISSN(online) 2456- 0774,April.
[14] Agaj i Iorshase, Onyeke Idoko Charles,"A Well-Built Hybrid Recommender System for Agricultural Products in Benue State of Nigeria", Journal of Software Engineering and Applications,2015,8,581-589
[15] G. Adomavicius and A. Tuzhilin(2005), "Toward the Next Generation of Recommender Systems: A Survey of the State-of-theArt and Possible Extensions," IEEE Trans. Knowledge and Data Eng., vol. 17, no. 6, pp. 734-749, June.
[16] Avinash Jain, Kiran Kumar (2016),"Application of Recommendation Engines in Agriculture", International Journal of Recent Trends in Engineering & Research, ISSN: 2455-1457.
[17] Kiran Shinde (2015),"Web Based Recommendation System for farmers", International Journal on Recent and Innovation Trends in Computing and Communication, Volume 3,Issue 3, ISSN:2321- 8169,March.
[18] Konstantinos G. Liakos, " Machine Learning in Agriculture: A Review", Sensors 2018, 18, 2674; doi:10.3390/s18082674
[19] Vaishnavi, M.Shobana, N Geethanjali, Dr.S.Karthik, "Data Mining: Solving the Thirst of Recommendations to Users", IOSR Journal of Computer Engineering (IOSR-JCE), Vol.16, no.6, 2014.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY