IJEAST

INTERNATIONAL JOURNAL
OF ENGINEERING APPLIED SCIENCE
AND TECHNOLOGY

VOLUME : 6 ISSUE : 6 Print / Issue Publication Date: 10-Jan-2022

ISSN : 2455-2143

DOI : 10.33564/IJEAST.2021.v06i06.019

Indexed In

Google SCHOLAR OPEN ACCESS doi Crossref

WWW.IJEAST.COM

editor@ijeast.com

International Journal of Engineering Applied Sciences and Technology, 2021
Vol. 6, Issue 6, ISSN No. 2455-2143, Pages 133-137
Published Online October 2021 in IJEAST (http://www.ijeast.com)

APPLICATION OF MACHINE LEARNING AND DEEP LEARNING IN SMART AGRICULTURE

Mrs A T Umrani(Chimanna)
Department of CSE
Walchand Colleage of Engineering, Sangli.

Mrs S A Aitwade
Department of CSE
Walchand Colleage of Engineering, Sangli.

***Abstract*— In the modern era of industrial revolution Artificial intelligence, Machine learning, Deep learning, IoT and Robotics have become more and more popular in research and also used in many applications such as natural Language processing, visual data processing, social network analysis, drug discovery, image classification, text mining and so forth. Nowadays deep learning has applied in many applications of smart agriculture such as water and soil management, crop cultivation, crop disease detection, weeds removal, crop distribution, robust fruits counting and yield prediction. This paper is focusing on how the deep learning is used for smart agriculture.**

Agriculture plays a vital role in the economic growth of any country. With the increase of population, frequent changes in climatic conditions and limited resources, it becomes a challenging task to fulfil the food requirement of the present population. Precision agriculture also known as smart farming have emerged as an innovative tool to address current challenges in agricultural sustainability. The mechanism that drives this cutting edge technology is machine learning (ML). It gives the machine ability to learn without being explicitly programmed. ML together with IoT (Internet of Things) enabled farm machinery are key components of the next agriculture revolution. In this article, authors present a systematic review of ML applications in the field of agriculture.

The purpose is to develop Drone which carries pesticides to spray all over the farm which reduces the work of farmers as well as it finishes his work soon. The application of pesticides and fertilizers in

Agricultural areas is of prime importance for crop yields. This is to develop a user friendly interface for the farmers. The Drone is a pesticide spraying hexa copter for agricultural purpose which helps

the farmer to spray the pesticides all over his land so that it reduces his work which can evenly spray all over his farm. Here the farmer can control the drone using an android app and he can connect to the app using Wi-Fi module (ESP 8266) which is interfaced in the drone. It will precisely route the land area of that particular farmer and using GPS. Here we have used the Arduino board which is the open source electronics prototype platform which is interfaced with the Wi-Fi module and GPS. The Drone can balance the directions and orientations.

This article demonstrates how knowledge-based agriculture can improve the sustainable productivity and quality of the product.

Keywords—Machine Learning, IOT, Drone Technology

I. INTRODUCTION

Agriculture ensures the food security for the country thats why it is the backbone of the country. It plays a vital role in external trade of most of the country. In most parts of the world approximately 75% of people rely on agriculture as a livelihood. Due to the boom of population there is a need to increase yield in the field of Agriculture so we have to improve the status of Agriculture in better way. Farmers are looking for efficient ways to increase the crop production in less expense and efficient utilization of available resources. This contributes new implementation of digital technologies in agriculture field to help the farmers to make better decisions and increase yields. Nowadays using deep learning methods we can overcome various problems and challenges in agriculture fields [1].

Learning may be Supervised, Unsupervised and Reinforcement learning. In agriculture, natural language processing, spam email filtering, malware filtering, online fraud detection, optical character recognition and face detection supervised techniques are used. In sentiment analysis, market segmentation and anomaly detection unsupervised techniques are used. Recently AI, ML, DL, IoT and robotics are very helpful in agriculture field to minimize the manpower, improve the quality of crops, water and soil management and detect crop disease in early stages. For the past 10 years most researches are going on deep learning in Agriculture field.

II. DEEP LEARNING FOR SMART AGRICULTURE

At present deep learning, computer vision, image processing, robotics and IoT technologies are very supportive to farmers. AI based drone technology is very helpful for farming because it makes it easier to monitor, scan and analyse the crops by providing high quality images. This technology is useful to identify the progress of the crops. In addition, farmers can decide whether the crops are ready for harvest or not. There is

International Journal of Engineering Applied Sciences and Technology, 2021
Vol. 6, Issue 6, ISSN No. 2455-2143, Pages 133-137
Published Online October 2021 in IJEAST (http://www.ijeast.com)

no limit to describe the applications of deep learning in Agriculture even some of the applications of DL in agriculture are given below. The following diagram Fig 1 shows the applications of deep learning in Agriculture.

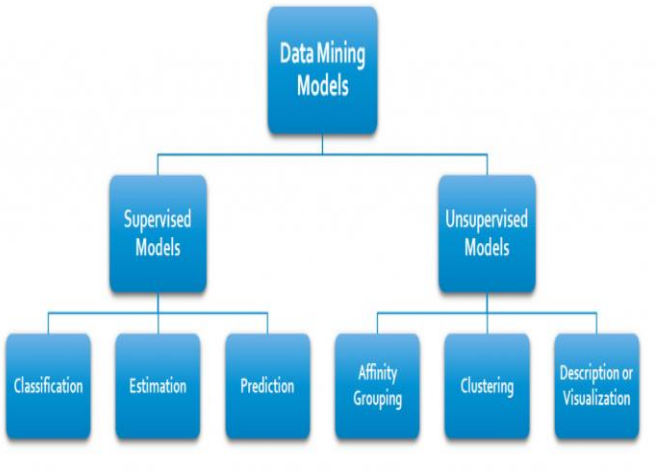
Applications of Deep Learning in Agriculture Crop Management

1. Plant Disease detection
2. Fruits Counting
3. Yield Prediction
4. Weed detection
5. Crop management
6. Soil Management
7. Water Management
8. Spraying Pesticides

III. Literature Review:

MACHINE LEARNING FOR SMART AGRICULTURE
Classification using Machine Learning Techniques

Machine learning is tool of data mining; which is related with developments of techniques and methods that enables the system to learn. It is thought that a machine learns when it changes its structure, program and data so that there is an improvement in its future performance. It can also be asked that why machine has to go through the learning process in spite of why it cannot be specifically designed to perform a desired task. It has been observed that some task cannot be defined without examples. Sometimes it is possible to define the input output pair only but not the relationship, which exists among them. So, to understand the relationship among input output pair's, machine has to go through the learning process. In learning, machine adjusts the internal structure to produce the exact output.



Now the question arises that what should a machine learn to produce the correct output. There are varieties of computation structure a machine has to learn such as function, programming logic, problem-solving techniques etc. [6].

➢ Categories of Machine Learning

Supervised Learning needs training on data which is labelled and it has inputs and desired outputs, whereas unsupervised learning does not need labelled data for training and it needs inputs without any essential outputs. Reinforcement learning learns from feedback gathered through interactions from an external environment.

1. Supervised Learning:- Supervised machine learning is the generation of algorithms which can easily generate the normal form of different patterns along with the hypotheses b using the external source of instances as well as predict future instances respectively. Main aim of this technique is to categorize data from prior information. It examines and reviews the training data and from that analysis it tries to infer a function which may be further used for mapping new examples. In an ideal scenario, it will permit the algorithm to properly identify the labels of class for unseen instances. The learning algorithm should be able to generalize from the training knowledge to future conditions in a best plausible way. Classification is used frequently in data science problems. Supervised machine learning techniques are discussed as below: **Naive Bayes Classifier**

In naive bayes classifier we have some the labeled datasets, form that we tried to train the data, i.e. checkout the prior probability of the different class labels in the system. Prior probability is the probability which is taken priory, when the new data is not included. Not after taking care of prior probability we try to calculate posterior probability where we try to check the probability of that new data for which we have to derive class label, with the objects lying close to that object.

Artificial Neural Network

An ANN is an information processing model which is motivated by the way biological Nervous Systems, such as human Brain, process information [6]. It contains unique structure of the data processing system.

Advantages:
1. Adaptive learning: it's a capability to discover how tasks can be done based on raw data stated for training or early experience.

International Journal of Engineering Applied Sciences and Technology, 2021
Vol. 6, Issue 6, ISSN No. 2455-2143, Pages 133-137
Published Online October 2021 in IJEAST (http://www.ijeast.com)

2. Self-Organization: It may construct its individual specific structure or description of the information, which it takes through learning time. [6]

Decision Tree

It is most popular method for presenting classifiers. Scientists from different areas such as statistics, machine learning and pattern recognition have to deal with the matter of generating a tree from available data.

The Advantages are that Decision trees are self–explanatory, when compressed they can be easily followed; it can handle nominal as well as numeric input attributes and Decision trees are efficient for managing data sets that can have missing values and Errors.

The Disadvantages are many decision tree algorithms like ID3 and C4.5 need that the target attribute will have only distinct values.

Random Forest

It is basically a type of classifier as the name also states the Random Forest classifier that contains several decision trees as well. Each decision tree generation is done by the help of the random vector. The working of this general method is to pick out the random value say f for attributes (features) in order to form the decision tree at the output side o form tree shaped structure as shown in the figure 3. The same process goes on till the optimal output is obtained at the end side and finally the prediction set is generated. In the formula below shows finding of the value f:

F = log2 (M +1)…….. (1).

Where, m is the total number of variety that are present in the training set to choose the attributes, which is done in the random way.

- Firstly, Choose a significant value of n that will ultimately shows the variety of trees that can be formed in a given random forest.
- Secondly, the generation of the bootstrap samples will take place along with the bagging method for the given set of the training set.
- At each node in a tree, choose the f value which is obtained from equation (1).
- The formation of the Random Forest will continue to be shaped without the presence of any pruning. It is now proven also that it helped to get rid of bias in the proportion of predicted effects.
- The outputs of the predictions that are received from the class of every selection tree inside the random forest.

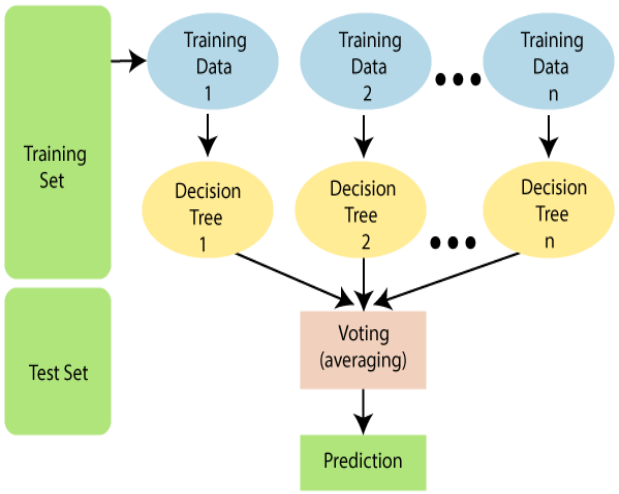


Figure 3: RF classifier.

Support Vector Machine (SVM)

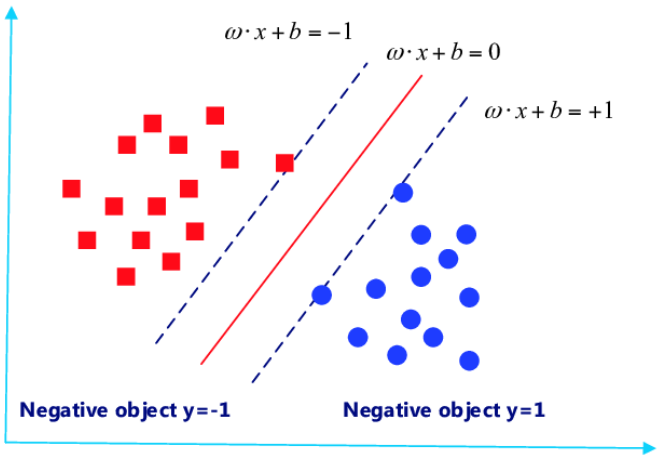
Vapnik and his colleagues first introduced SVM in1995, currently, a novel supervised ML technique, called SVM, has gained more attention in the fields of pattern classification, regression Estimation and data analysis, outlier detection in both liner nonlinear data. Non- parametric with binary classifier method can be used by SVM and it can manage more input data very well.

SVMs capacity and accurateness totally depends on the choice of hyper plane (that has the biggest distance to the closest preparing information purpose of any class which is called most extreme edge) and portion boundary.

Fundamentally SVMs are of two sorts.

(1) Linear SVM, that breaks the information focuses by a straight choice limit

(2) Non Linear SVM, that breaks the information, focuses by a non-linear choice limit.



International Journal of Engineering Applied Sciences and Technology, 2021
Vol. 6, Issue 6, ISSN No. 2455-2143, Pages 133-137
Published Online October 2021 in IJEAST (http://www.ijeast.com)

Figure 4: SVM classifier.

Unsupervised Learning:-

In unsupervised learning we don't have things like labeled data, or training data we just have some random data, and we try to group them by the behaviors of the data, if the data is showing some similarity then it will group by the behavior and similarities, in other words we are just trying to convert unlabelled data to labeled data. K means could be the best example for unsupervised learning.

K-means

K-means algorithm works similar to clustering, in clustering we try to combine the random data, into groups or we can say clusters, which are having similar properties similar behavior.In k-means algorithm we try to have k- centroids, the k centroid will be the number of classes which are needed to divide the data in, then we try to divide the different unlabelled data, into their nearest centroid labels, after that we try to estimate the distance where it should belong and then again we try to change the place of centroid, and repeat that step again, until the centroid reach its proper place, and nearby data has been defined proper class to it.

Reinforcement Learning:-

In order to understand the meaning of reinforcement learning, we should know the meaning of reinforcement, Reinforcement means the result of strengthens the behavior such that it can perform better than how it was behaving before. And learning has done on the basis of that, which is called reinforcement learning. Markov decision process, Monte-Carlo approximation problem etc are the examples of reinforcement learning.

Markov decision Process

In markov decision process, we have to keep the few things in mind that is state which is it in, the action which is going to take and the state which it will come after doing that action. Markov in markov decision process means only the present matters, that means it's not concern about the things which you did in the past, or the state where you came from, it is just concern about the state where you and where you will end up.

Then one more factor that is very important and which we should keep in mind is the reward. As in when you reach from one state to another, the action which you did in coming to the next state, it is beneficial for getting the result, or it is better than the other action if we take and end up on that state, i.e. the property of reward.
Prediction of a hybrid algorithm model that is viewed as a suggested model. The paradigm is innovative since there is no availability of such a hybrid approach to classification. NN based on Delaunay for anxiety diagnosis review. In the flowchart drawn below elaborates the procedure of the proposed work as-

Storing data: The obtained data from social media will stored in the sample dataset

Binarizing: The stored data will ultimately get converted into binary form. Also the algorithm will linearize the data using linearizing.

Pre-processing: It is a process in which the data will be processed before applying algorithm, which is of use will go to further step and the unused data will get deleted.

Feature selection: In this step the selection of particular feature will be done for the further implementation of the algorithm, which done by feature extraction and false removal.

Applying classifier: In the proposed work SVM classifier is applied, and NPRtool will also applied for the specification of the dataset.

The Role of Drone Technology in Smart Agriculture

With the world supply at an all-time high and commodity prices at an all-time low as a result of increasing demands in food production and consumption, the modern farming industry is at a crossroads. There is a greater need than ever before for farmers and agronomists across the globe to improve resource management in response to tightening budgets, while the "farm to fork" movement has seen rising pressure for enhanced product traceability, as consumers become more interested in the origin of the goods they purchase and how they were grown. Furthermore, climate change continues to create new layers of complexity for the agriculture industry in protecting the security of the supply chain. Rapidly evolving environmental conditions further exacerbate these challenges, and the latest figures show that the overall loss to agriculture across Europe from climate change could be as high as 16% by 2050. Indeed, optimizing sustainability credentials to minimize the impact on the health and well-being of the public and the planet will remain a priority, particularly as enhanced sustainability measures could also provide additional economic benefits by enabling agriculture professionals to focus their resources and efforts more effectively.

IV. METHODOLOGY:

1) Decide basic structure and requirements of project.

2) Finding the appropiate material and collect them. Then assemble all the parts with proper testing.

3) Creating a drone with proper positioning of material like motors, propellers, flight controller, pumps etc.

4) Creating an anroid application which will work as signal Transmitter to control the drone.

5) Finally deploy the drone on field.

Outcomes/Applications

1) The main application of our product in the agriculture purpose is for spraying the fertilizers.

2) This drone will serve a lot in agricultural fields.

3) The application will be user – friendly, cost-effective (one time investment).

Technology Stack

Hardware -:

Drone frame , Flight controller ,Propellers ,

Pump ,Spray parts ,Battery 5200mah ,Charger for the battery ,

receiver ,ESC 40amp, Power distribution board ,

Disc motor.

Android Application

Framework : React native

Java Programming

Database : - Firebase

V. CONCLUSION:

- The Freyr Drone will help the farmer to spray the pesticides all over his land, which will be an alternative for carrying pesticides bags
- This will boost the research and technique in agriculture field .
- It reduces the work of farmers as here the farmer can control the drone using an android app.
- It will precisely route the famer's land using GPS no matter shape of the field and type of the crop, the drone will get the job done.

VI. REFERENCES:

1) https://aero-drone.in/

2) http://www.thanos.in/products/

3) https://youtu.be/4gGMMPMm9MQ

4) https://ieeexplore.ieee.org/document/7972289

5)http://www.niam.res.in/sites/default/files/pdfs/Use-of-Drone-in-Indian-Agriculture.pdf

6)Prof. Swati D Kale, Swati V Khandagale, Shweta S Gaikwad, Sayali S Narve, Purva V Gangal, "Agriculture Drone for Spraying Fertilizer and Pesticides" published in iijarsse Volume 5 , Issue 12, December 2015.

IJEAST

INTERNATIONAL JOURNAL
OF ENGINEERING APPLIED SCIENCE
AND TECHNOLOGY

ABOUT IJEAST

International Journal of Engineering Applied Science and Technology (IJEAST) is a peer-reviewed, open access journal that publishes high-quality research papers in the field of Engineering, Applied Science and Technology.

IJEAST aims to provide a platform for researchers, academicians, and professionals to share their innovative ideas, research findings, and practical experiences with the global scientific community.

FOCUS AREAS

- Engineering
- Applied Science
- Technology
- Innovation & Development
- Interdisciplinary Studies

PEER REVIEWED
All submissions are rigorously peer reviewed to ensure quality.

OPEN ACCESS
Free and unrestricted access to research for all.

GLOBAL REACH
Connecting researchers and professionals worldwide.

TIMELY PUBLICATION
We ensure a swift and efficient publication process.

For more information, visit our website
www.ijeast.com

INTERNATIONAL JOURNAL
OF ENGINEERING APPLIED SCIENCE
AND TECHNOLOGY

editor@ijeast.com
www.ijeast.com
India

2455-2143