Use of Artificial Intelligence in Agriculture

Akshaya Gambhire,
Department of Computer Science,
K.J. Somaiya college of Science & Commerce
Mumbai,
akshaya.g@somaiya.edu

Shaikh Mohammad Bilal N.
Department of Computer Science,
K.J. Somaiya college of Science & Commerce
Mumbai,
mohammadbilal@somaiya.edu

***Abstract*: We all know that in this modern era, technology plays a very important role in every task. In every field technology is used to enhance work efficiency, for less time consumption and for perfect and better results. Food, shelter, and cloth are three essential things for human beings. Increasing population ultimately leads to increased farming results. At today's date farming techniques are enhanced using technology such as artificial intelligence which results in enhanced quality of yield. This paper throws the vision on how the use of technology can be fueled the result of different sectors of agriculture.**

Keywords: Artificial Intelligence, Technology, Farming, Machines

I. INTRODUCTION

Now everything has become faster and easier because of technology. In the 19th century when the industrial revolution took place machines were deployed as substitutions for humans. It reduces human labor as well as gives more perfection in the work. In the present day, it is the reality that artificial intelligence is empowering human labor. In agriculture there is a quick adaptation of Artificial Intelligence in its various techniques. Attending more efficient farming practices using technological advancements and solutions is the need of the current situation. Use of technologies like artificial Intelligence will help farmers to do more with less, by enhancing the quality of crops. Until the industrial revolution man-power was one of the main factors of farming. In the present day different techniques are used like disease detection, identifying the readiness of crop, depending upon soil which fertilizer should use[11], field management and many more. Factors such as climate change, population growth and food security concerns in the industry and this leads to the development of more innovative approaches to protect and improve crop yield.[10] This results in the use of the farming industry.[5] At present in India Microsoft Corporation is working in Andhra Pradesh with 175 farmers rendering different services.[12] Now the question arises: what is Artificial Intelligence? Artificial Intelligence refers to simulation of human intelligence in the machines that are programmed to think like humans and mimic their actions.

II. EXISTING SYSTEM

Farming or agriculture is the biggest industry in our country and plays a key role in social and economic growth of the country. Before adapting a technology in agriculture, farming is done using traditional techniques and methods. Farming depends on many factors or we can say many factors affect farming. In India we found different environments, different weather, different soils which are suitable for different crops at different places. Farmers use to harvest a particular type of crop or the cycle of crops. In India, in most of the regions farming depends upon rain or water availability. The eight major steps farmers perform are crop selection, land preparation, seed selection, seed sowing, irrigation, crop growth, fertilizing and harvesting. And all these steps are performed manually only which requires more human and animal labor.

III. LITERATURE REVIEW

Sr. No	Author	Research paper	Advantage	Disadvantage
1.	**Verónica Saiz-Rubio**	**Smart Farming towards Agriculture - 2020 [10]**	Current status of advanced farm management systems with the end goal that producers can make streamlined choices to save money while securing nature.	A few studies report that horticultural robots incorporating types of AI can carry out specific responsibilities quicker than people. In spite of there are different examinations that negate this announcement, mechanical autonomy is a developing economy and robots are unusual.
2.	**Alexander M. Petrov, Mikhail A. Kanaev**	**Technical devices used for differential fertilizer application - 2020 [11]**	Portrayed new specialized gadgets for differential utilization of manures considering heterogeneity of the thickness of the humus horizon.	It costs a lot of money and huge computation power to make or buy robots and to train models for AI.
3.	**Victor Mokaya**	**Future of Precision Agriculture in India using Machine learning and Artificial Intelligence - 2019[13]**	Conversation on the eventual fate of exactness agribusiness which has been demonstrated to work in different nations utilizing AI and computerized reasoning. The extent of usage is centered around medium and enormous scope ranchers with a plan to bring up the points of interest and detriments of the methods.	To cultivate and advance accuracy agriculture through guides, reliefs, charge occasions and different motivators to ranchers will enormously pull in speculation. This move will subsequently help conscious endeavors to ensure the development and supportability of people in the future yet to come.

IV. APPLICATIONS OF AI IN AGRICULTURE

Most popular applications of AI in agriculture appear to falls into three major categories as follows:

1. Agriculture robotics:
   Companies are developing and programming autonomous robots to handle agriculture tasks at higher volume and faster pace than humans.[8]
2. Crop and soil monitoring:
   To monitor crops and soil health drones or software-based technology is used to collect/capture data and uses computer vision and deep-learning algorithms to process that data.[2]
3. Predictive analytics:
   AI used models are used to track and predict various factors which affect the crop yield such as weather change[2].

a. Disease detection:
   The image sensing and analysis ensure that the plant leaf images are sectioned into surface areas like diseased area, non-diseased area and background area. For further diagnosis cropped images of diseased or infected area sent to the laboratory this results into identification of pests and nutrient deficiency.[1]

Fig 1: Disease Detection

Methods:
1.Data description
2.Measurement of performance
3.Approach

Total 60 experimental configuration depend od following parameters:

1. Choice of deep learning architecture:
AlexNet,
GoogLeNet.

2. Choice of training mechanism:
Transfer Learning
Training from Scratch.

3. Choice of dataset type:
Color,
Gray scale,
Leaf Segmented.

4. Choice of training-testing set distribution:
Train: 80%, Test: 20%,
Train: 60%, Test: 40%,
Train: 50%, Test: 50%,
Train: 40%, Test: 60%,
Train: 20%, Test: 80%.[9]

b. Identify readiness of crop:
Recognizing a ripe green fruit is not as easy as it sounds. It requires great skill and still has some rate of human error. Using AI we can get accurate results without the need of human intervention. We get the images with a camera in presence of white light and uva light which will then be processed in a computer. The result by the computer will be considered as a final result. [3]

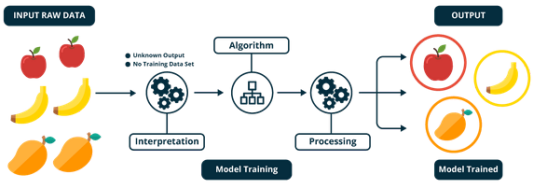

Fig 2: Fruit Ripening Detection

c. Field management:
Using different techniques of AI to manage the field to get more profit, it is always better to take precautions for any thing, by using AI we can predict the change in the weather, future need of the crop and soil which will save the future failure.[4][11]

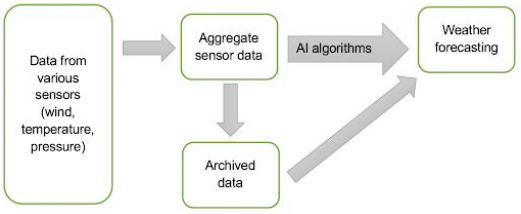

Fig 3: Field Management

d. Crop Health monitoring:
Health monitoring is really important for high yield of grown crops. Remote sensing techniques along with 3D laser are able to construct a crop matrics over acres of land.[5]

e. Precision Farming:
Precision farming is the technique or method which helps farmers to increase the yield and improve the performance or final output.This is the morden farm approach to increase profit, reduce cost, reduce use of pesticides,fertilizers[6].
Goals of precision farming:

a. Profitability
Recognize crops and market strategies

b. Sustainability
Different operations for improvement based on seasons.

c. Efficiency
Allow to use all resources effectively.[5]

V. CHALLENGES IN AI ADOPTION IN AGRICULTURE

When anything new comes in the system it is difficult to adopt it for everyone, like that many challenges are present in adopting artificial Intelligence in agriculture.Every new thing is easy to use when we know about it and we already know about it. Many farmers who know about technology can use it but what about others who belong to rural areas. To make them understand that use of technology can increase productivity in the field is one of the biggest challenges. [7]

VI.CONCLUSION

Artificial intelligence can be proper and viable in the agribusiness division as it improves the asset use and efficiency.It explains the shortage of assets and work to a huge degree. Appropriation of AI is very valuable in agriculture.Artificial knowledge can be an innovative transformation and blast in agribusiness to take care of the expanding human populace of the world. Man-made reasoning will supplement and challenge to settle on right choices by farmers.

VII. ACKNOWLEDGEMENT

I pay gratitude to my supervisor Mr. Mohammad Bilal Shaikh for guidance, support, patience and understanding throughout the research period, also my sincere gratitude goes to K.J. somaiya college for giving me this opportunity.

REFERENCES

[1]Sharada Prasanna Mohanty, David Peter Hughes, Marcel Salathe, “Using Deep Learning for Image-Based Plant Disease Detection”,April 15,2016

[2] Kumba Senar,”AI in Agriculture-Present Applications and Impacts”, November 21,2019

[3]DavidIreri,”A computer vision system for defect discrimination and grading in tomatoes using machine learning and image processing”. 17 June 2019

[4]Imran Ali Lakhiar,Gao Jianmin,Tabinda Naz Syed,Farman Ali Chandio,”Monitoring and Control Systems in Agriculture Using Intelligent Sensor Techniques: A Review of the Aeroponic System”,19 Dec 2018

[5]Paras M. Khandelwal and Himanshu Chavhan,”Artificial Intelligence in Agriculture: An Emerging Era of Research”,September 2019

[6]K. Mufeedha,E. Abhilash Joseph,V. M. Abdul Hakkim,”Precision Farming: The Future of Indian Agriculture”, November 2016

[7]Joseph Byrum,”The Challenges for Artificial Intelligence in Agriculture”, February 20, 2017

[8]David Ball,Patric Ross,”Robotics for Sustainable Broad-Acre Agriculture”, January 2015

[9]Parul Sharma,Wiqas Ghai,”Performance analysis of deep learning CNN models for disease detection in plants using image segmentation”, 18 November 2019

[10]Verónica Saiz-Rubio,”From Smart Farming towards Agriculture 5.0: A Review on Crop Data Management”, 3 February 2020

[11]Alexander M. Petrov, Mikhail A. Kanaev,”Technical devices used for differential fertilizer application”, January 2020

[12]Kasmin Fernandes,”Artificial Intelligence in Agriculture in India”, January 10 2020

[13]Victor Mokaya,”Future of Precision Agriculture in India using Machine learning and Artificial Intelligence”, March 2019