International Journal of Research Publication and Reviews

Artificial Intelligence in Agriculture

¹Nidha Zaina. A. I, ²Shruthi Vishalakshi. R*

¹I BSc AIML Sri Krishna arts and science college, Coimbatore, Tamilnadu, India
²I BSc AIML Sri Krishna arts and science college, Coimbatore, Tamilnadu, India

A B S T R A C T

The purpose of this paper is to provide a comprehensive review on the academic journey of artificial intelligence (AI) in agriculture and to highlight the challenges and opportunities in adopting AI-based advancement in agricultural systems and processes. The domain of agriculture faces many challenges such as disease and pest infestation, mistaken soil treatment, insufficient drainage and irrigation, and many more. These leads to severe crop loss alongside with environmental risks due to excessive use of chemicals. Several researches have been conducted to tackle these issues. The field of artificial intelligence with its rigorous learning skills have come to be a key approach for fixing distinct agriculture associated problems. Systems are being developed to help the agricultural specialists for better solutions throughout the world. This paper addresses the software of artificial intelligent strategies in the most important subdomain of agriculture. Weather forecast are the critical areas identified in agriculture to act on. Any impacts or distractions in those areas can pay way to disruptions economy growth. Weather forecast are the crucial areas identified in agriculture. Any effects or diversion in these sectors may result in disruptions to the expansion of the economy. Providing a service at a lower cost and successfully operating at scale is what businesses and farmers want. Robots have undergone extensive testing in this area, and have gotten better throughout the years. Agriculture is a sector where automation is important because it eliminates complex and tiresome human labour. From the perspective of the consumer, maximising the output while minimising chemical influence and maintaining high quality has been the goal. Such an application of AI in agriculture can notify or warn about the calamities and follow the safest approach, saving lives from natural disasters .

Keywords: Artificial intelligent; agriculture; internet of things; machine learning ; smart agriculture .

1. INTRODUCTION

Artificial intelligence is one of the key areas of research in computer science because of its rapid technological advancement and vast area of applications. Agriculture is one of the industries where AI is absolutely important. Despite having a very short history of development, experts and the government acknowledge the significant role performed by AI, aside from traditional approaches. When McKinion and Lemmon developed GOSSYM, a cotton crop simulation model employing Expert System to maximise cotton production under the effect of irrigation, fertiliser, weed control-cultivation, climate, and other factors, they made the first attempt at using AI to agriculture. John McCarthy first proposed a study based on the idea that "every aspect of learning or any other feature of intelligence can, in principle, be so precisely described that a machine can be made to simulate it" [1] at the 1955 Dartmouth Conference, where the term "Artificial Intelligence" was first used. Because of its ability to address issues that people struggle to effectively solve, artificial intelligence (AI), one of the key disciplines of computer science, has recently made inroads into a number of industries, including manufacturing, healthcare, finance, and education [2]. Humans are still astounded by what AI is capable of. Robots are providing extra assistance to make the work easier, but scientists and backend engineers found it difficult to integrate them into the agriculture sector. It had to be a situation where complex activities were involved because few robots were designed to be of limited value. Nonetheless, multipurpose robots have now been developed. Currently, agricultural activities are the main source of income, which boosts GDP. being a hub for international trade, reducing poverty, hard labour, and unemployment, providing raw materials for other industries and machinery, and eventually growing the economy. Sowing seeds, planting, pulling weeds, applying fertiliser, harvesting, etc. are all sequential steps in the agriculture process.

Fig. 1.1 smart farming

Fig 1.2 AI in agriculture technology

2. METHODOLOGY

Every day, farms produce lots of facts points on temperature, soil, usage of water, climate condition, etc. With the assist of artificial Genius and laptop studying models, this data is leveraged in real-time for acquiring beneficial insights like selecting the proper time to sow seeds, figuring out the crop choices, hybrid seed alternatives to generate greater yields.

AI systems are helping to improve the usual harvest exceptional and accuracy – regarded as precision agriculture. AI science helps in detecting disorder in plants, pests and poor nutrition of farms. AI sensors can become aware of and goal weeds and then determine which herbicide to follow inside the region. This helps in reduced usage of herbicides and cost savings. Many technological organizations developed robots, which use computer vision and synthetic brain to display and exactly spray on weeds. These robots are capable to do away with 80% of the volume of the chemical substances commonly sprayed on the crops and convey down the expenditure of herbicide with the aid of 90%. These shrewd AI sprayers can drastically reduce the number of chemical substances used in the fields and for that reason improve the first-rate of agricultural produce, and convey in fee efficiency. Many groups are working on enhancing agricultural efficiencies. There are products like independent strawberry-picking machine1 and a vacuum apparatus that can harvest mature apples from trees. These machines use sensor fusion, computing device vision and synthetic brain fashions to identify the vicinity of the harvestable produce and help select the proper fruits.

Agriculture is the second greatest enterprise after Defense where service robots market have been deployed for professional use. The International Federation of Robotics estimates that as many as 25,000 agricultural robots have been sold —matching the range used for military purposes.Innovative startups are using AI in the field of agriculture. A Berlin-based agricultural tech startup3developed a multi-lingual plant sickness and pest diagnostic app, which uses various photographs of the plant to discover diseases; a smartphone collects the photo that is matched with a server picture and then a analysis of that specific disease is supplied and utilized to the crop the usage of wise spraying technique. In this way, the utility makes use of AI and ML to remedy

plant diseases. Over seven million farmers have downloaded this app and it has helped identify over 385 crop diseases amongst area crops, fruits, and vegetables.
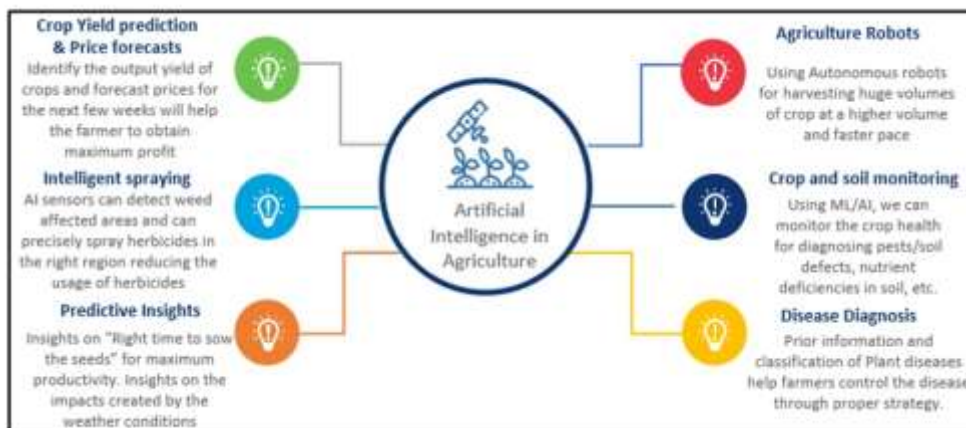

Fig. 1.3 – AI in Agriculture

3. RESULTS AND DISCUSSION

Over the decades, the traditional practices of agriculture have been transformed. The increasing population and scarcity of land has invoked people to get creative and efficient. Using the available land to its optimum level has become vital. Previously, people were reluctant to adapt to the technological improvements. However, now it is mandatory that they accommodate to these advancements in order to survive in the industry. Technologies like Artificial Intelligence, Machine Learning, etc. have emerged to bring evolution to various industries.

The artificial intelligence (AI) technology is supporting different sectors to boost their productivity. The AI solutions have helped overcome the challenges faced by several industries and now it is steadily making its place in the agriculture sector too. AI technologies have a sizable impact on the agriculture sector.AI can provide farmers with real-time insights from their fields, allowing them to identify areas that need irrigation, fertilization, or pesticide treatment. Also, innovative farming practices like vertical agriculture may help increase food production while minimizing the use of resources. That's the best way to describe the progress of AI in agriculture. The industry, despite being the least digitized, has finally seen momentum for the development and application of various AI technologies. Finally, more farmers and companies see the value of AI-assisted processes. Healthier crops, real-time field condition monitoring, higher process efficiency, reduced need for manual labor, and better harvest quality—those are just some of the benefits.

4. CONCLUSION

The future of AI in farming largely depends on the adoption of AI solutions. Although some large-scale researches are in progress and some applications are already in the market, yet industry in agriculture is underserved. Moreover, creating predictive solutions to solve a real challenge faced by farmers in farming is still in progress at an early stage. Artificial intelligence in agriculture not only assists farmers in automating their agricultural operations, but also changes to precision cultivation for improved crop output and quality while using less resources. This review presents an overview of the application of AI technology in agriculture. Corresponding to the current social situation of decreasing manual labor, limited usable agronomic land and a greater gap between total food produced and the world population, AI has been regarded as one of the most feasible solution to those problems and has been developed and improved for years by scientists worldwide. In this review, the definitions of AI are first introduced, in which the highlight is the Turing Test. Then two sub fields that AI has been playing an important role in are demonstrated, which are in soil management, weed management, and Internet of Things (IoT), a useful data analysis and storing technology that has wide application in agriculture, is introduced. This review also points out three major practical challenges of AI in agriculture: first, due to certain geographical, social or political reasons, the distribution of modern technology is uneven, which foreshadows that the application of AI will have its limitation in certain areas; secondly, despite significant improvements made in the past years, to transfer AI-based machines and algorithms from control experiments to real agricultural environment requires much more studies and research, and to be able to handle large sets of data and to interpret them accurately and quickly are two main challenges that need to be addressed in order to enable the application; finally, the security of devices used in open spaces of agricultural environment and the privacy of data collected are also problems to address. Then this review specifically introduces the development of agricultural robots. First, a couple of examples of robots designed to tackle different tasks in the agricultural industry are listed. There are autonomous mobile robots that can spray pesticides in greenhouses, tractors that use GPS and machine vision and have a travelling path pre-programmed, apple picking robots that use a Cartesian coordinate system to locate objects, two types of robots that manage weed problems and innovate in several directions, such as physical mobility and the ability to distinguish between crops and weeds, an apple harvesting machine that has an innovative flexible gripper, etc. Then the review indicates challenges of applying agricultural robots, basically circulating around the question of the unpredictability in real environments, but underscores the considerable development and a promising prospect in this field.

References

The future of food and agriculture: Trends and challenges-Food and Agriculture Trends and challenges-Food and Agriculture Organization of the United Nations,ISSN 2522-722X,Rome,2017.

Coulson, R.N., Folse, LJ. and Loh, BK (1987) Artificial Intelligence and natural resource management. Science, 237, pp. 262-268

Munakata, T. (1998) Fundamentals of the new artificial intelligence (Vol. 2) Heidelberg: Springer.

Blue River Technology: See & Spray Agricultural Machines http://www.bluerhvertechnology.com/

Harvest Croo-Agricultural Robotics https://harvesteroo.com/

FarmShots- http://farmshots.com/

SkySquirrel Technologies- https://www.vineview.ca/

aWhere: Agronomic Data & Agricultural Data Management http://www.where.com/

https://agfundernews.com/the-challenges-for-artificial intelligence in agriculture.html