



REVIEW ARTICLE

A REVIEW ON USE OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN AGRICULTURE

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ARTICLE DETAILS

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ABSTRACT

The implementation of artificial intelligence (AI) and machine learning (ML) techniques in the field of agriculture has gained significant attention in recent years. This report explores the various applications of AI and ML in agriculture, focusing on their benefits, challenges, and future prospects. By analyzing existing research and case studies, this report aims to provide insights into the potential of AI and ML technologies to revolutionize farming practices and improve crop yield, resource management, and sustainability in the agricultural sector.

KEYWORDS

Artificial intelligence, machine learning, analysis, unemployment

1. INTRODUCTION

In present context agricultural sector plays a vital role in ensuring food security and sustaining the growing global population. However, numerous challenges such as climate change, limited resources, and labor shortages have led to the exploration of innovative technologies. Artificial Intelligence (AI) has emerged as a powerful tool that can revolutionize the agricultural industry by enhancing productivity, optimizing resource utilization, and improving decision-making processes. This report explores the various applications of AI in agriculture and their potential benefits.

2. AI IN AGRICULTURE

AI-powered systems can monitor and analyze crop health, growth, and yield through various techniques such as remote sensing, computer vision, and machine learning algorithms. Drones equipped with cameras and sensors can capture high-resolution images of fields, enabling farmers to identify crop diseases, nutrient deficiencies, or water stress. Machine learning algorithms can analyze this data to provide actionable insights and recommendations, allowing farmers to make informed decisions regarding irrigation, fertilization, and pest control (Liu, 2020).

AI facilitates precision farming techniques that enable farmers to optimize resource usage and maximize crop productivity. By integrating AI with data from sensors, weather forecasts, soil analysis, and historical data, farmers can precisely tailor irrigation, fertilization, and pesticide applications to meet the specific needs of individual plants or areas within a field. This targeted approach minimizes waste, reduces environmental impact, and increases overall efficiency (Ampatzidis, 2018).

AI algorithms can analyze vast amounts of data, including historical climate patterns, soil conditions, and crop performance, to generate predictive models. These models can forecast crop yields, disease outbreaks, and optimal planting and harvesting times. By providing accurate predictions, AI assists farmers in making proactive decisions, optimizing production, and minimizing risks (Bokonda et al., 2020)

AI-driven robotics and automated machinery are transforming

agricultural operations by reducing labor-intensive tasks and improving efficiency. Robots equipped with computer vision can perform delicate operations like selective harvesting, reducing the need for manual labor. Autonomous vehicles can navigate fields and perform tasks such as planting, spraying, and monitoring. These technologies save time, increase precision, and enhance worker safety (Acemoglu and Restrepo, 2019).

AI can monitor and analyze the health and behavior of livestock using sensors, wearables, and computer vision. These technologies can detect early signs of illness, identify individual animals, monitor feeding patterns, and optimize breeding programs. By proactively managing livestock health, AI can improve animal welfare, reduce costs, and increase productivity (Fuentes et al., 2022)

3. METHOD

For the preparation of this review various sources were used to study the recent trends and advancements. To acquire present knowledge regarding the implementation, advantages, and drawbacks of AI and ML techniques in agriculture, an examination of research papers, articles, and case studies was performed. The outcomes were systematically arranged and presented in a well-structured manner, aiming to offer a comprehensive grasp of the topic at hand.

4. RESULTS AND DISCUSSION

As advancement in the technology use of drone in the agriculture has increased to demonstrate and problem and measures to solve them (Author et al., 2016). Increased productivity and yield through optimized resource management (Lakshmi and Corbett, 2020). Reduction in the use of water, fertilizers, and pesticides, leading to improved environmental sustainability (Menaga and Vasantha, 2022). Enhanced decision-making capabilities through accurate data analysis and predictive models (Bokonda et al., 2020; Rahmani et al., 2021). Minimized crop losses by early detection of diseases, pests, and nutrient deficiencies (Lakshmi and Corbett, 2020; Liu, 2020). Improved livestock management and health monitoring, leading to better productivity and animal welfare (Helwatkar et al., 2014). Labor-saving and increased efficiency through the use of automated machinery and robotics (Acemoglu and Restrepo, 2019).

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Identification of weed and application of weedicide is another recent achievement of weed. Self-driving of the tractor in the agricultural field is also ongoing practice (Ryo, 2022).

5. CHALLENGES AND LIMITATION

Use of AI by large scale farmers creates the cost-efficient source of production as labor has to be used less and large-scale surveillance measure can be adopted. In another way a better economy of scale can be adopted by the farmers adopting AI but for the rural and small farmers not using AI cost of production is high which brings price gap and in equality (Bao and Xie, 2022). An ethical problem also exists which regards data privacy and algorithmic bias (Bartneck et al., 2021). One of the major and most concerned problem created by the use of AI and mechanization is increase in unemployment (Petropoulos, 2018).

6. SUMMARY AND CONCLUSION

The application of AI and ML in agriculture has the potential to transform farming methods and address the problems that the industry is now facing. Farmers may use these technologies to improve productivity, use resources more efficiently, and make data-driven decisions while limiting their negative effects on the environment. To successfully integrate AI and ML in agriculture, however, a number of issues must be resolved, including data accessibility, technical proficiency, and ethical considerations. To get beyond these challenges and guarantee that AI and ML technologies are widely used in the agriculture sector, governments, researchers, and agricultural stakeholders must work together.

In conclusion, the use of AI and machine learning in agriculture has enormous promise for productive and sustainable farming methods. With more investigation, creativity, and encouraging regulations, AI and ML can make a big contribution.

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