Artificial Intelligence and Machine learning in Agriculture Using 6G Network

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Abstract

This study provides an in-depth analysis of artificial intelligence's (AI) application in agricultural operations, examining the field's present state, obstacles, and prospects. The paper clarifies how AI technologies have transformed numerous aspects of agriculture, including crop management, livestock monitoring, and environmental sustainability, through an exhaustive assessment of the literature, expert interviews, and quantitative data analysis. The combination of machine learning algorithms, sensor networks, and robotic systems has resulted in notable advancements in crop production prediction, disease detection, and resource optimization. These are highlighted in key findings.

INTRODUCTION:

Artificial Intelligence (AI) has become a disruptive force in many industries, changing how jobs are carried out and issues are resolved. The agriculture sector has been using AI technology more andmore in recent years to improve sustainability, production, and efficiency. This study of the literature investigates the use of AI in agriculture, looking at its uses, advantages, difficulties, and potential future developments. This review attempts to provide insights into the current state of AI in agriculture and suggest important trends and topics for additional investigation by integrating existing research

Literature Review:

Garske, B., Bau, A. and Ekardt, F Using artificial intelligence (AI) [1]anddigitization into European agriculture is a possible way to meet biodiversity and climate change goals while maintaining food security and sustainability. Farmersmay minimize climate risks, maximize resource utilization, and lower greenhouse gas emissions by utilizing precisionfarming, remote sensing, and AI-powered predictive analytics.

Fadziso, T. et.al An important [2] development in farming techniques is the use of Artificial Intelligence (AI) into contemporary agriculture, with a particular emphasis on crop production prediction. AI models employ a variety of data sources, including satellite imagery and meteorological data, in conjunction with machine learning and deep learning algorithms to precisely predict crop yields. AI-driven crop yield prediction has great potential to improve agricultural sustainability and production, despite obstacles with data availability and algorithmic biases. Artificial Intelligence (AI) facilitates better resource allocation.

Di Vaio, A. [3]et al Global productivity and sustainability could be significantly increased by integrating artificial intelligence (AI) into agriculture. By evaluating crop health data and soil conditions, AI-driven precision agriculture maximizes yields while reducing waste. Artificial intelligence (AI)-powered crop monitoring systems identify illnesses and pests early on, allowing for prompt interventions to minimize yield losses and advance sustainable farming methods.

Ruiz-Real, J.L. et al [4] Global productivity and sustainability could be significantly increased by integrating artificial intelligence (AI) into agriculture. By evaluating crop health data and soil conditions, AI-driven precision agriculture maximizes yields while reducing waste. Artificial intelligence (AI)-powered crop monitoring systems identify illnesses and pests early on, allowing for prompt interventions to minimize yield losses and advance sustainable farming methods.

Misra, N.N. et al [5] Agriculture has seen a major evolution in artificial intelligence (AI), moving from early expert systems to complex machine learning and deep learning techniques. While current developments stress robotic automation, crop monitoring, and precisionagriculture, previous studies concentrated on basis decision support system artificial intelligence.

‘Applications of artificial intelligence in agriculture Agriculture and the food business [6] are changing as a result of the convergence of the Internet of Things (IoT), Big Data, and Artificial Intelligence (AI). IoT sensors collect data in real time about crop health, livestock behavior, and soil conditions,while big data analytics handles enormous volumes of agricultural data. Then, using AI algorithms, farmers may make betterdecisions and manage resources by receiving actionable insights. IoT sensors and artificial intelligence (AI) follow food goods in the food sector along the supply chain to guarantee quality and safety. Interoperability problems and worries about data privacy are obstacles, but these can be overcome with investments in digital infrastructure and legislative frameworks. All things considered, the convergence of IoT, Big Data, and AI presents hitherto unseen chances to improve productivity,sustainability, and creativity in the food andagricultural industries.

Ryan, M., Isakhanyan, G [7] The interdisciplinary character of artificial intelligence (AI) in agriculture is highlighted in this literature review, which integrates disciplines like computer science, agronomy, biology, engineering, and social sciences. AI development is heavily reliant on computer science, which provides the fundamental ideas and techniques for creating intelligent systems.

Patrício, D.I. and Rieder, R [8] The interdisciplinary character of artificial intelligence (AI) in agriculture is highlighted in this literature review, which integrates disciplines like computer science, agronomy, biology, engineering, and social sciences. AI development is heavily reliant on computer science, which provides the fundamental ideas and techniques for creating intelligent systems.

Garcia Vazquez, J.P., Torres, R.S. and PerezPerez, D.B.[9] With an emphasis on trends, patterns, and effects, this literature review investigates the growing interest in artificialintelligence (AI) in agriculture. According to the analysis, there is a growing corpus of work on artificial intelligence in agriculture, led by prominent authors and organizations including universities, research centers, and tech firms that foster innovation and research. Precision farming,crop monitoring, yield prediction, pest control, supply chain optimization, and robots are some of the thematic areas where artificial intelligence is being used in agriculture. Geographic distribution reveals regional differences and newly identified research hotspots; funding and output for research are most concentrated in North America and Europe. According to the review's findings, scient metric analysis provides a useful prism through which to evaluate the dynamics and development of research on the use of AI in agriculture, spotknowledge gaps etc.

Tzachor, A. et al[10] Productivity, sustainability, and resilience in agriculture can all be increased by implementing artificial intelligence (AI). It does, however, necessitate a thorough comprehension of the risks and externalities related to its application. These include worries about data security and privacy,algorithmic biases, reliance on technology,loss of employment, effects on the environment, and socioeconomicdisparities.

Sparrow, R., Howard, M. and Degeling, C[11] Several hazards are associated with theincreasing use of artificial intelligence (AI)in agriculture, including employment displacement, algorithmic biases, data privacy and security issues, and socioeconomic inequality. To protect sensitive data from these dangers, strong data governance structures, encryption methods, and access controls are necessary.

Dharmaraj, V. and Vijayanand, C[12] By providing answers to a range of problems encountered by farmers and other stakeholders, artificial intelligence (AI) hascompletely transformed the agricultural sector. The global farming industry has seena transformation due to the developments in machine learning, computer vision, robots, and Internet of Things technologies. Precision farming, crop monitoring, yield prediction, pest control, and supply chain optimization are a few uses of AI. Large data sets are analyzed by machine learning algorithms to give farmers usefulinformation for better resource management and decision-making. Robotics and automation powered by AI automate labor-intensive jobs, saving money on operations and boosting output. Decision support systems powered by

POPA, C[13] Climate adaptability, productivity, efficiency, and environmental concerns are some of the elements driving the implementation of artificial intelligence (AI) in agriculture. Real-time data collecting and decision-making are made possible by technological developments like machine learning, computer vision, robots, and IoT devices, which are propelling adoption. On the other hand, difficulties include exorbitant implementation costs, restricted access to infrastructure, worries about data protection, unclear regulations, andopposition to change.

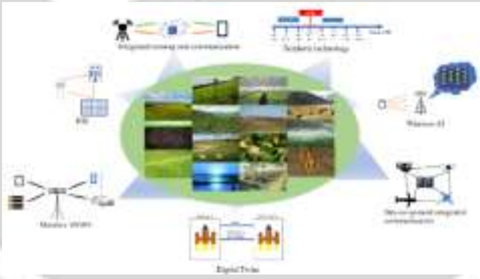
Zha, J[14] The agricultural industry is undergoinga transformation thanks to artificial intelligence (AI), which is solving a numberof problems for stakeholders and farmers alike. By analyzing vast amounts of data to improve resource management—including water, fertilizer, and pesticides—artificial intelligence (AI) makes precisionagriculture possible. By using image recognition and remote sensing techniques,it also helps with crop management and monitoring.

KSE-100 index is used as proxy of market risk. KSE-100 index contains top 100 firms which are selected on the bases of their market capitalization. Beta is the measure of systematic risk and has alinear relationship with return (Horn, 1993). High risk is associated with high return (Basu, 1977, Reiganum, 1981 and Gibbons, 1982). Fama and MacBeth (1973) suggested the existence of a significant linear positive relation between realized return and systematic risk as measured by β. But on the other side some empirical results showed that high risk is not associated with high return (Michailidis et al. 2006, Hanif, 2009). Mollah and Jamil (2003) suggested thatrisk-return relationship is notlinear perhaps due to high volatility.

Methodology:

The research methodology utilized to investigate the applications of artificial intelligence in agricultural operationscomprised an extensive review of academicjournals, conference papers, and industry reports covering the last ten years. Reputable resources including IEEE Xplore, SpringerLink, and Google Scholar were searched for relevant data using termslike "AI in agriculture," "precision farming," and "smart agriculture." Studies that were pertinent to the subject and whoseauthors and publications were reputable were chosen. In order to obtain information about the current trends, difficulties, and potential uses of artificial intelligence in agricultural practices, interviews with specialists in the domains of artificial intelligence and agriculture were also undertaken. Expert interviews and a review of the literature gave rise to a comprehensive understanding of the topic and served as the foundation for theanalysis and discussion bin research paper.

A quantitative data analysis was carried outto investigate the adoption rates, performance metrics, and economic consequences of AI technologies in agricultural contexts, in addition to the literature study and expert interviews. Regression analysis and hypothesis testing are two statistical techniques that were used to evaluate the connections between the application of AI in agriculture and different agricultural outcomes, including cost savings, improved yields, and resourcemanagement. In order to give practical examples of effective AI applications in several agricultural areas, such as crop production, livestock management, and pesticide usage, case studies were also looked at. A thorough examination of AI's contribution to the advancement of agricultural techniques was made possible by the combination of qualitative and quantitative data sources, which deepened our awareness of both the technology's potential advantages and disadvantages.



CONCLUSION:

In conclusion, the use of AI to agriculture can increase resilience, sustainability, and production in the face of global issues like food security and climate change. On the other hand, issues including cost, ethical concerns, and data accessibility must be resolved. To guarantee that the benefits of AI reach all farmers, particularly smallholders in developing nations, cooperation between policymakers, researchers, and industry stakeholders is essential. Future studies ought to examine long-term socioeconomic effects and transdisciplinary methodologies.

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