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AI IN AGRICULTURE BY MAYANK CHOUDHARY (35515002818) The use of Artificial Intelligence in agriculture is makin a huge impact worldwide, with many industries lookin to automate jobs using intelligent machinery. Even agriulture! This industry is one of the oldest and most important professions globally, playin a big role in the economic sector. The global population is expected to reach over 9 billion by 2050, requirin an increase in agricultural production by 70% to fulfill demand. A smarter approach is needed to become more efficient about how we farm and be most productive. In this article, I will cover the challenges faced by farmers using traditional methods of farming and how AI is makin a revolution in agriculture by replacin tradional methods with more efficient ones and helpin the world to become a better place. Artificial intelligence has the potential to deliver much-needed solutions for the agricultural sector. Farmers are now able to produce more output with less input and even improve the quality of output, also ensurin faster go-to-market for yielded crops. By 2020, farmers will be using 75 million connected devices, and by 2050, the average farm is expected to generate an average of 4.1 million data points every day. The industry is turnin to Artificial Intelligence technologies to help yield healthier crops, control pests, monitor soil, and growin conditions, organize data for farmers, help with the workload, and improve a wide range of agriculture-related tasks in the entire food supply chain. Use of weather forecasting can help farmers plan the type of crop that can be grown and when seeds should be sown. Artificial intelligence also helps farmers to monitor soil and crop health, which is important for the success of any farm. This technology provides valuable insights into how to improve the health and productivity of crops, which is crucial for the agricultural sector. By using AI in agriculture, farmers can make informed decisions about how to manage their land and resources more effectively. Overall, the use of artificial intelligence in agriculture has the potential to revolutionize this industry and help it become more efficient and productive. It is a powerful tool that can be used to improve crop yields, control pests, monitor soil health, and many other important tasks in the agricultural sector. Soil type and nutrition play a crucial role in crop quality, but deforestation has led to soil degradation making it hard to assess its quality. AI-powered apps can help identify nutrient deficiencies, plant pests, and diseases by analyzing images of the soil or crops. This technology can also suggest fertilizers that improve harvest quality. Meanwhile, drone-based solutions like SkySurrel Technologies provide aerial imaging for crop health analysis, helping farmers detect pests and bacteria in a timely manner. However, the agricultural sector still faces significant challenges such as irrigation system absence, temperature fluctuations, and groundwater density. Despite ongoing research and available apps, more robust AI applications are needed to tackle these realistic challenges effectively. As AI continues to evolve, it's expected to shift agriculture towards precise cultivation for better yields and quality while utilizing fewer resources. Companies developing machine learning or AI-based products will see technological advancements in the future, providing more useful applications to address global food production issues driven by a growing population that will reach 10 billion by 2050, necessitating a 70% increase in food production with only a 4% additional land available. The agricultural industry is poised for a transformative shift with the integration of AI technology. By leveraging AI, farmers can overcome challenges, improve quality, and increase yields. AI has numerous applications across sectors, including farming, where it can bring about a paradigm shift. With AI-powered solutions, farmers can do more with less, ensuring sustainable agriculture practices. AI is being rapidly adopted in agriculture, both in terms of agricultural products and in-field farming techniques. Some of the key applications of AI in agriculture include automated farming activities, identification of pest and disease outbreaks before they occur, managing crop quality, monitoring biotic and abiotic factors, and stress levels. Machine vision systems and phenotypic data can also be used to make adjustments. One example of the potential benefits of AI-powered irrigation systems is the reduction of production costs for vegetables, making the industry more competitive and sustainable. Additionally, automated irrigation systems can minimize environmental impacts caused by excess water usage, maintain optimal soil moisture levels, and reduce labor input required for maintenance. Another area where AI is making a significant impact is in crop health monitoring using remote sensing technologies. With high-definition images from airborne systems like drones or copters, farmers can create detailed field maps and identify areas that require water, fertilizer, or pesticides. This approach helps optimize resources to a great extent. The benefits of using AI-powered remote sensing technologies include the ability to analyze crops more efficiently than traditional methods, which are often time-consuming and categorical. With automated digital detection and analysis technologies, farmers can gain valuable insights into disease detection, pest identification, nutrient deficiency recognition, and more. Source: Barman A., Neogi B., Pal S. (2020) Solar-Powered Automated IoT-Based Drip Irrigation System. In: Pattnaik P., Kumar R., Pal S., Panda S. (eds) IoT and Analytics for Agriculture. Studies in Big Data, vol 63. Springer, Singapore. The use of advanced technologies like spectroscopy, 3D mapping, and hyperspectral imaging allows for a significant increase in the number of measurable crop properties, transforming data into mathematical values. This approach creates a virtual world of phenotype information, enabling more precise analysis and decision-making in agriculture. In contrast to traditional methods, AI-driven techniques such as Artificial Neural Networks (ANNs), Genetic Algorithms (GAs), and Grey System Theory (GST) can provide accurate predictions and insights for crop yield and management. These systems utilize sophisticated software, sensors, and GPS technology to optimize farming operations, including the use of driverless tractors and precision fertilizer planning. The Hortibot, a self-propelled robot, uses GPS and weed-removing attachments to identify and eliminate 25 different types of weeds, making it an eco-friendly and cost-effective solution for agriculture. Drones are also being utilized in precision farming, enabling farmers to map nitrogen-deficient areas, control weeds and diseases, and optimize crop spraying. As the use of AI and drones continues to grow, they have the potential to transform the agriculture sector by providing real-time data, improving crop yields, and reducing waste. With their ability to perform key tasks and take on bigger roles in the future, these technologies are poised to revolutionize farming practices. The use of AI optimises resource usage and efficiency, significantly addressing resource scarcity and workforce shortages. In agriculture, AI can spearhead a technological revolution, enabling global food production to keep pace with an increasingly populous world. By leveraging AI, farmers will be empowered to make informed decisions and adapt their practices to ensure optimal crop yields while minimizing waste.