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Agriculture Solutions Using Artificial Intelligence

Ajay Kumar Sahu[1], Vikas Singhal[2], Shivani Dubey[3], Arti Singh[4]
Department of Information Technology, Greater Noida Institute of Technology (Engineering Institute), Greater Noida, India

Abstract: ***Agriculture plays a major role in the economic sector. Automation in agriculture is a major concern and a growing topic around the world. The population is growing significantly, and with it the need for food and jobs. The standard methods used by farmers were not sufficient to meet these needs. Therefore, a new method of machine control was introduced. These new roads have created a need for food and provided employment opportunities for billions of people. Informatics in agriculture has revolutionized agriculture.***

The main purpose of this paper is to study various applications of computers in agriculture. For irrigation, weeding, and spraying using sensors and other devices integrated into robots and drones. These techniques also help conserve water, pesticide, and herbicide overuse, maintain soil fertility, save labor, increase productivity, and improve quality. This article explores the work ofa few researchers to provide an overview of current implementations of agricultural automation and weed control systems using robots and drones. The various soil moisture detection method area units described above include two mechanically controlled weed control technologies. Our research mentions the use of drones, and further mentions various uses of drones for spraying and crop monitoring. This research presents a comprehensive overview of artificial intelligence technology and its importance in agriculture.

Keywords: Artificial Intelligence, Agriculture Land, Soil, Drone, Agriculture, Robotics, Smart Farming.

I. INTRODUCTION

The FAO (Food and Agriculture Organization) of the United Nations predicts that the world population will increase by another 2 billion people in 2050, but only 4% of the arable land area will be added at that time. In this case, cutting-edge technological solutions are used to make agriculture more efficient. The direct application of AI or machine intelligence across the agricultural sector could epitomize the changes in agriculture today. Using artificial intelligence, we can develop intelligent farming practices that minimize farmer losses and deliver proven high yields. AI-powered agricultural solutions enable farmers to do more with less, improve quality, and ensure rapid (GTM) crop-to-market strategies. The current paper presents a vision of how various areas of agriculture can be enhanced with AI. It also considers the future of agriculture and future challenges. Therefore, a new method of machine control was introduced. The main purpose of this paper is to study various applications.

II. LITERATURE SURVEY

In this article, the authors have experimented with the character evolution of computer science over the past 50 years and its ubiquity in all areas due to its strengths within applications. One such area is crop and soil management. Plant and soil management faces multiple challenges every day and is not a smooth-running business.[1] Some of the main problems farmers face from seed to harvest are: Plant disease prevalence, chemical control, weed control, lack of irrigation and drainage systems. Computing and machine learning permeate all the above areas. The authors categorized AI class progress by class and provided a brief overview of various AI techniques.

It was from his 1983 that computers and technology began gaining a foothold in the field. Since then, several proposals and planned systems have been made to improve plant and soil management ranging from information to method processes. Filtering each method, only the AI-based system proves to be the best and most reliable method possible. AI-based methodologies do not generalize, they provide specific answers to specific complex problems. This article describes technological advances in crop and soil management.

We first describe the percolation of artificial neural networks and qualified systems to solve the previous problem, then machine learning and symbolic logic systems. After all, it is about automation and IOT in agriculture. In this article [2] the author experimented with an automatic water management system that might be useful for the sake of farmers, we will jointly open up an appreciation for future technologies of the future. The author also describes many problems that arise while implementing this kind of automation. The issue of water management is at the center of the global environmental debate. The irrational distribution, leakage, contamination, and overuse of groundwater are some of the greatest

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water management challenges. Industry leaders are now looking into AI development services for water management systems to mitigate the damage caused by water crises to AI and IoT devices. Together, these technologies provide an effective mechanism for monitoring water quality, detecting leaks, assessing needs, and directing global water stewardship. In this article [3], The various soil moisture detection method area units described above include two mechanically controlled weed control technologies. Authors experimented that image processing techniques with the necessary electronic hardware and application systems can be used very successfully to apply various doses of pesticides to unhealthy crops. bottom. Therefore, the aim of this study was to develop an imaging technology-based chemical nebulization system with variable duration so that the applied chemicals can be used precisely according to the severity of the disease. To achieve this goal, this study was funded with the following specific objectives: Development of an image processing algorithm program for estimating disease severity over time. Development of a variable rate spray system for precise application of pesticides at different disease severity levels. Evaluation of the performance of the developed variable rate chemical spray system under field conditions. In this article [4], the authors experimented that all processes in agriculture are important and play an important role in helping farmers carry out their daily activities in a more structured way. Here we mainly focus on his one of the important processes in agriculture, the harvesting process. He also talked about traditional harvesting methods before technological advances and explained the modern harvesting process. He began to distinguish between traditional and modern processes. The traditional process uses mainly human labor for cultivation, management and maintenance, and all other processes use only human intervention and effort.

III. ARTIFICIAL INTELLIGENCE

Artificial intelligence is one of the key areas of computer science research due to its rapid technological progress and wide range of applications. One of the main areas where the presence of AI is sorely needed is agriculture. Agriculture in general is a major occupation requiring a lot of hard work, perseverance, and perseverance, with a low income and a comfortable lifestyle. Farmers work so hard to grow suitable crops, which takes a lot of time, that they are forced to accept agriculture as their main source of income.[5] However, with low incomes and sometimes poor yields from the land due to weather conditions and scarcity of resources, farmers face losses and worsening financial situations, ultimately leading to depression and suicide. The main reason for the same problem is not choosing the right-side hustle because it wastes more time and energy. AI in agriculture can help solve these sensitive problems by reducing the time and effort required to near zero. Appropriate use of AI will ensure uniform planting and proper crop growth resulting in improved yields and consequently improved farmer lifestyles. AI in agriculture can help farmers plan secondary income streams, boost morale, and help avoid depression and suicide. With the goal of increasing the dominance of AI in agriculture. AI solutions can help overcome common challenges in every field. AI in agriculture can help increase farmer capacity and reduce environmental impact. The agriculture industry is heavily and over-embedding AI into its operations to transform its bottom line. AI is changing the way food is produced, even as emissions from the agricultural sector are reduced 2/100. By adapting AI technology, we can adapt and cope with any unwelcome natural conditions. Currently, most agricultural startups are adopting AI-powered approaches to increase the efficiency of agricultural production. According to a market research report, the global market size for computing (AI) in agriculture is expected to reach US$1.55 billion by the end of 2025. Implementation of AI-assisted approaches may include the application of AI in agriculture [5].

IV. IMPORTANCE OF AI IN AGRICULTURE

Artificial intelligence (AI) can be used across disciplines and could bring about a paradigm shift in how we look at agriculture today. AI-powered solutions not only enable farmers to do more with less, but also because of the increasing use of high-tech machines in public life, such as in education, hospitals, and even government., also helps farmers to produce higher yields. Agriculture is the most relatable because artificial intelligence focuses on simple and intelligent ways of working. Agricultural land will be advanced with AI for low cost and easy processing. Various problems in agriculture will be controlled by artificial intelligence in a short period of time. There are various techniques in artificial intelligence, such as improving crop quality or introducing indoor farming to increase crop production rate. There are many uses for AI that can really help farmers, including: You can also analyze farm data to improve crop quality and accuracy, use AI sensors to detect targeted weeds, detect plant diseases, pests, and more. AI is fighting the workforce problem [6]. Therefore, as we all know, the number of people in this profession is decreasing, and farmers are facing problems such as labor shortages and labor shortages. The solution to this problem is an agricultural bot that works with farmers. This bot harvests more and faster. There is an agricultural robot used for weed control at Blue River Technology. Harvest CROO Robotics introduces harvesting. Robotics has developed robots for farmers that harvest and pack their crops.

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AI also performs diagnostic analytics, such as satellites for weather forecasting and crop sustainability. The Soil is one of the most important success factors in agriculture Knowing changes in weather in advance is very helpful for farmers. The unmanned tractor is one of his AI techs that can operate without a human on the tractor itself, saving farmers a lot of work. One interesting technology to watch is Farmer's Alexa, which, like a chatbot, can communicate with farmers to solve tough problems. Crop spraying technology will also help farmers, as aerial spraying by drone is five times faster than conventional machines. One of the intelligent applications where AI has been introduced in agriculture is the Agri-Calculator. This helps farmers select suitable and affordable crops and calculate prices. There are many other applications on the market, but the problem is the high cost and complicated documentation. Simply put, the use of AI in agriculture will enable farmers around the world to work more efficiently. Structure of sludge [7].

The Soil is one of the most important success factors in agriculture and as a food source soil contains water, nitrogen, phosphorus, potassium, etc. protein sand progress can improve soil conditions Compost and fertilizers that improve soil permeability Combination with other power systems Suppresses physical deterioration of soil with the earth e.g. organization, e.g., negative factors Can reduce soil-borne pathogens and toxins [7]. Another example is the ability to create floors using AI. A map that helps depicts the relationship between soils and landscape Multiple layers of underground and multiple sizes of soil.

A. Weed Management

Weeds are one trait affecting farmer health Most predictable profit: e.g., weed infestation Yield can be lost by50% if uncontrolled Dehydrated beans and corn plants and weed competition May increase wheat yield by 48%. Weed Compete with crops for resources such as water and nutrients. Even if some are poisonous, and the sun's rays It can even end anger public health. Spraying is done frequently, may have adverse effects when used to control weeds Public and economic use can pollute the environment Surroundings.[8] Hence artificial intelligence weeds Discovery system tested in workshop Calculate the exact amount of spray to use You can spray exactly where you want, so you can keep costs down. And the threat of destructive crops.



Figure1: Weed Management

B. Use of Internet of Things Technology

The Net of Effects (IoT) is an organization that consists of: Computer equipment, machines, etc. Substances that are consistent and each offer something Has a single identifier and has data competencies contagion; infection. So, itis person to person or person to person. You can avoid any relationship with the computer. IoT is further development builds on some current Technologies such as Wireless Sensor Networks (WSN), Cloud Computing and RFI dentification. What IoT can do Used in several fields. B. Monitoring and Accuracy agriculture, Traction and Tracking, Green house's construction, and agricultural machinery [9]. For example, Agricultural creation chain tracking and tracking Consists of information inputs (complete life cycle). Products, transport processes, etc.), capacity store information fora period; Data transmission, processing, and output. Of Carry in and tracking of artifact cables available Market abledis closure, justification of beliefs between the parties Sellers and Buyers - by viewing the full history Products that agribusiness can produce make better decisions, find better business partners, Save time and money. IoT applies data exploration Information exists in different ways various methods of device data, audio, images, etc. video. Contain zones where data analysis is critical Prognosis, camp organization, selection, homestead Organization, precise application, insurance, etc [10].

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Figure2: Use of Internet of Things Technology

V. CHALLANGES IN AI AGRICULTURAL TECHNOLOGY

A. Future Adoption of Mechanization will Likely be Uneven

Robot delivery prediction to end an average increase of 9% each period from 2011 to 2013 12% YoY increase in US, 12% increase in Asia/Australia Europe is expected to grow by 8%. Estimate the spread according to this trend The number of robots will be 15% to 75% by 2030 2045. However, with the spread of computerization, likely unevenly distributed, missing some zones Access to Resources and Impossible Conditions Rehabilitate with scientific knowledge and technology development [11]. For example, most AI systems do this, so may be justified, and consumed onthe Internet Limited to remote or rural areaswith no network Service and perception when dealing with AI processes [11]. Therefore, introduction is slow and unevenly distributed AI behavior in agriculture needs to be predictable, On the other hand, whether the implementation picks up momentum Growing food outside of certain natural land boundaries It is still unclear whether. Proposed scheme.

B. Control Experiments and Actual Contradictions

The details obtained in the application are different Because the images are used in a controlled atmosphere, Features such as lighting error Difficulties in the background, viewpoints at that time Add grains refined in the field, such as capture, even in the same place as an outcome of exposure to additional essentials such as creatures, mud, slow substances. trendy this situation, physiologically Difficulty increases depending on individual characteristics Be careful when dealing with variables, images. Therefore, you will need a greater than extra varied usual of controls Information was essential to restore the present organizational correctness. still need help Algorithms such as computer vision and DBN (Deep Belief) networks) and CNNs (Convolutional Neural Networks), Despite the minor amount of situation educations, identify hopeful posts for next year Providing large amounts of complex data [12]. In addition, there are instructions to reduce response time system, the data processed must be the best Relative. System performance It is dangerous to work accurately in a short time Critical to commercial value and worrying users Strong Choice–What Customers Reflect Most reduce the effort required of them, Maximize accuracy.

Table:1 Browsing Categories and Subcategories Harvest

Category	Subcategory
Crop	Precision and smart agriculture, social and economic impact, management zone
Platform	Platform remote sensing (satellite and aircraft), proximity sensor (ground vehicle)
Data	Big data, internet of things (IOT), allocation, information system (GIS, FMIS)
Decision	Decision artificial intelligence (AI), Decision Support System (DSS)
Actuation	Variable rate application (VRA)

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Figure3: Security and Privacy Many Physical devices

C. Security and Privacy Many Physical Devices

IoT is initially vulnerable to attack. Hardware. Devices can reside on one device, so long term space immediately. A common security promise size is data Encoding, tag frequency change, tag abort Rules, use of blocker tags, algorithms and data flow control policy, uniqueness verification There is a mechanism, etc., and there is a security problem Causes serious problems and should be addressed at various stages [13].

VI. DATA DRIVEN MANAGEMENT

IoT is initially vulnerable to attack. Hardware. Devices can reside on one device, so long term space immediately. A common security promise size is data Encoding, tag frequency change, tag abort Rules, use of blocker tags, etc. Location-based facilities It is also recognized from device stick attacks.[14] In other words, after the intruder has captured the device, Excerpts from Cryptographic Explanations and Therefore Unlimited access to data stored on the Internet convenient. Data can also be criticized if transportation from the device to the door, Data is uploaded to additional locations Organizations are like clouds. the cloud server Can result in data manipulation vulnerabilities Interfering with automated driving without permission at the ranch. Means such as assembly takeover, Login fraud and Denial of Service (DoS). It also wreaks havoc on cloud organizations. Consistent Security policy includes encryption, The raw size of the most important yield limit should be: Professionally managed and left with numbers and pictures It will turn into valuable information. Factory organization based on Field data has evolved with the advent of exactness agriculture [15]. It was bright 30 years ago but has certainly been refurbished the current digital information age. Conventionally and in places like this in areas where technology has not yet found a way, field organizations Visually validate and achieve revenue growth Judgments that farmers use to make and act on decisions They give plants different behaviors. This approach is based on Commentary on field experiences and information through the eyes of the field farmers. It can also be followed by related practitioners [16]. This management system Based on objective field data and intelligent decision making Manage a real crop and exploit its inner benefits Both spatial and temporal variability. Platform refers to the physical means of providing information. The acquired device is just that item. Objective data are collected. Data contains information directly Taken out of a boundary obstructed by crops, ground, or borders ambient. To recover data from your device, Done in several ways, from the introduction of a USB stick to one. USB port for retrieving files [17] for data recovery from software an application customized for the Internet. Connection Clean- up is required between data and decision phases Practices and AI Algorithms to GetOnly the Right Data It helps cultivators make accurate decisions [18]. Finally, actuation refers to the physical implementation of: It is an act dictated by the electoral system, and it is a matter of course. Communicated through available advanced equipment Command from electronic control unit. act as an individual It occurs over yield and the cycle begins at and ends at. harvest level. Crop responses are specifically recorded Devices and rings methodically progress until you win When it marks the end of the revenue lifecycle [19].

A. Development of agricultural robots Education then samples

Requests where AI theaters a significant part include: Develop robotic systems and incorporate automation for agriculture and further capacity development, Proven reliability, and accuracy A year of major changes in manual labor Automated work - required for centralized work. Mechanization is key to sustainable social action Singularities such as aging and people decline population, nonetheless in order to be talented to achieve exactly A traditionally complex process Farmers can get good value Permanent relics are a big challenge. Learn Development of robots for agricultural solutions is underway It was originally established in Japan in the 1980s. A robot that can spray pesticides [20]. recognize it Finding your way in an authentic farming atmosphere can be tough. Research team designed autonomy in 1996 Navigable mobile robot "AURORA" autonomous or adept at remote control A greenhouse that does exactly this job Conservative forced physical labor.

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In detail, the early inspiration for scheming automata precise to greenhouse atmosphere was that humanoid workers remain susceptible to insecticides, antifungals, and extra biochemical properties mainly fashionable the deep and deprived drying greenhouse atmosphere, which produced them skin sicknesses, chronic diseases and even humanity. One early example of farming robot the tractors attain an input, or more exactly, a program signifying the travelling path, from the global placement system (GPS), and using machine vision, the device can function along with yield line. In an experiment to estimate apple fruit place for treatment in 2000, robots calculated for selection apples used a Cartesian organize system to regulate the location of the apples. The non-linear slightest rectangular process was used to stock the horizontal and vertical circulation of apples. This can be applied to the design of manipulators for apple winning robots. About the weed control problematic mentioned overhead, the 2003 draft pointed toward trial a mechanical stage for weed colony planning and fixated on the flexibility then ease of use of the quatern-trundle scheme. Its functionality was agreed upon primarily through embedded organizers and standard communications. protocol. Increase Weed Control Ideas Shown in Another Study 2003 emphasized useful plants and inter-plant individuals. Weeds for detailed tracking of herbicide locations. Photograph Species detection with a focus happening herbal geomorphology is single of the greatest consistent procedures. If you have a function like B. Sheet edge, edge design and overall shape If determined, there should be a plant type understood. Due to unpredictability, the dimensions such as lighting conditions change [22]. The shape and location of leaves, and Seedlings vary greatly due to differences in conditions Flowering date, growth rate and difference in growth Environment such as temperature and humidity Differentiate among wildflowers and plant debris Stimulating. It also indicates that the device should do this Learn the functions you need based on your nerves A Network Approach (NN) to Achieve Desired Goals function. In addition, regarding the selection of herbicides, Total consumption is reduced when used in the field Therefore, it can reduce herbicide smog in water twenty-three]. Autonomous Fruit Possibility Engine (AFPM) On collecting apples, published in 2008 Focused on developing flexible grippers. Ensured decisive correctness Select by apple instead of collecting Variety at once minimizes Economic loss due to restoration of apple quality [twenty-four]. The fruit picking robot released in 2013 auto-abstraction method to apply various agricultural imaging systems and This method is based on the structure of OHTA color Planetary and sophisticated Otsu threshold algorithm. The OHTA paint space has the following color structure. Transform the color abstraction into one measurement as three-dimensional. New color feature Oh TH Color spaces are defined before Otsu. The threshold algorithm excerpts fruit elements created on: About products in the OHTA color space. distinction of Color helps identify the correct fruit. Outflow rate is over 95%, It represents its accuracy and usefulness [22].

B. Even in Experimental Research of Agricultural Robots

Agricultural Robots Have Created Great Things progress, working robot Complex agricultural atmosphere is not yet left Available on the market. Main purpose an algorithm that can handle it Bohemian and random real farming Since the atmosphere has not yet been created, other factors such as agricultural seasonality Also, the actual atmosphere and experimental atmosphere workshop. active and quick-change Period and intergalactic with a sophisticated atmosphere Almost inevitably, even intangible things Atmospheres such as guns and space Atmosphere and atmosphere Atmospheric situations are generally questionable. Rugged terrain, visibility, and light.

However, independence remains limited Construction using technology. Of The Pareto Principle has been extended to many tasks. basically, means it can be mechanized Applied to 80% of tasks, rest omitted 20% is very difficult. 80% for additional work Therefore, you can reduce mandatory manual work. automation. plus 80% mechanized can be seen as an evolution of the old-style Agricultural system towards full autonomy Agricultural systems and further practices become possible learn through learning with software, Hardware basics.

The non-linear slightest rectangular process was used to stock [23]. Tactical operations that require human intelligence. but it is different. Tractor is more than just buying AI and launching it. AI is not something that stands out. It is a set of technologies. Computerized by programming. Artificial intelligence is basically an imitation Pensive. It is about knowledge and problem solving Based on data. AI is truly the next level of growth Contributing to the development of intelligent agriculture and needing other technologies work.

In other words, to get the most out of AI, Farmers needed technology first undercarriage. it will take time, maybe It will take years to move this organization forward. but by doing that Therefore, the farmer will be ready to form vigorous plants. A technology ecosystem that passes the test time. Today's tech jobs need to imitate Round the part: how to restore tools, how can farmers approach fundraising? Challenges and how to address them simply and responsibly How machine learning can help resolve real-world fights, e.g. As an elimination of manual work. Arrival of AI Agriculture always pays off [24].

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C. How the min-max Algorithm Works

Here's how the minimax algorithm works: Let us take a quick look at an example. located below Let us take the example of a wild tree. A game for two. o in this example he has two players, one of which he is Maximisers are called Minimizers. O Maximiser tries to get the maximum possible score. Minimizer tries to achieve the lowest possible value Score.[25] o This algorithm smears his DFS, so in this ready hierarchy, to get there you must go all the way through the leaves end node. o the end node has an end value So, let us compare these values reset the tree follows. The most important phases are described below When solving a two-actor game tree [25]:

1) *Step 1:* In the first step, the algorithm builds the whole game tree and smears effectiveness goals to gain utility morale for lethal situations. For subtree diagrams, assume A is the early public of the diagram. Assume Maximiser gets the first round, worst case initial value is infinity and Minimizer gets the first round [26]. The next round is done where the worst-case primary price = +infinity.
2) *Step 2:* Nowadays, first determine the service price of the maximiser. Its early worth is -∞, so comparison the worth of each critical state-run to the early worth. Maximiser regulates the developed node value. Find the maximum value out of all. o for node D, max (-1, -∞) => max (- 1,4) = 4
3) *Step 3:* In the next phase it is the Minimizer's turn and all node values are compared to +∞ to determine the third level node values.

= min (4,6) = 4 for node B
for node C = min (-3, 7) = -3
for node E, max (2, -∞) => max (2, 6) =6

4) *Step 4:* Today it is Maximize d's turn.

for node F max (-3, -∞) => max (-3, -5) = -3
for node G, max (0, -∞) = max (0, 7) = 7

Then the maximum value of all nodes is selected again to determine the maximum value of the source node. Since this game tree only has four levels, we go straight to the base node, but there are more than four levels here in the real game [26].

for node A, max (4, -3) = 4

An overview of data challenges, possible solutions, and potential lost and gained by investing in these areas.

VII. CONCLUSION

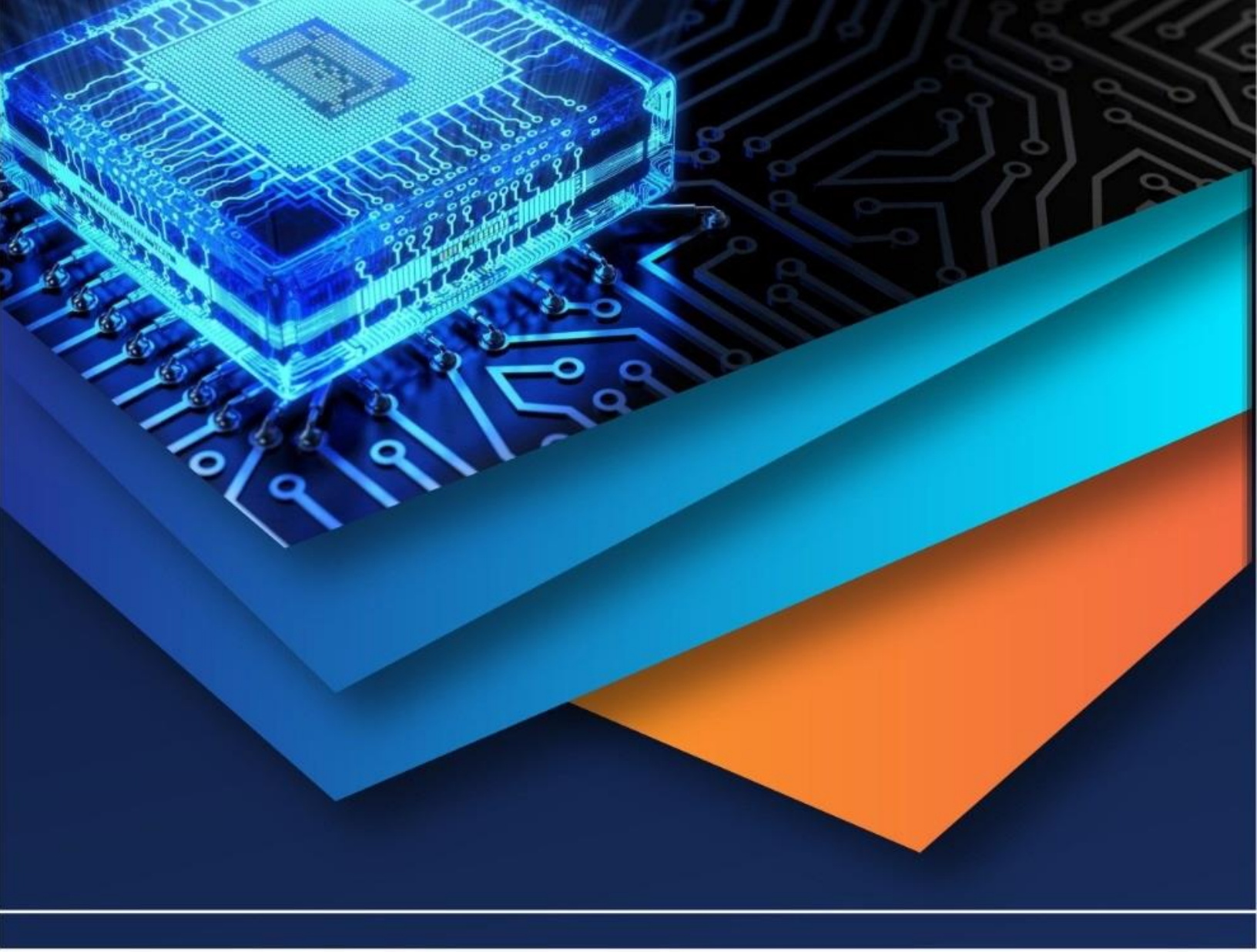
This analysis presents a summary of the application of AI technology in farming. Consistent to the present social condition of reducing physical labor, limited usable agronomical land-living and a larger hole between whole food produced and the world populace, AI has been regarded as one of the greatest possible solutions to those problems and has been developed and improved for years by scientists worldwide. In this analysis, the meanings of AI are initial presented, in which the highpoint is the Turing Test. Then two substitute fields that AI has been playing a significant role in are established, which are in the issue of randomness in the use of agricultural robots. The actual atmosphere remains. Soil organization, weed organization, and Internet of Things (IoT), a beneficial data study and storage knowledge that has varied bid in farming, is announced. This analysis likewise facts available three main real-world tasks of AI in farming primary, owed toward confident topographical, community, or radical details, the supply of up-to-date the technology is patchy, suggesting that AI is reaching its limits in certain areas. Secondly contempt substantial developments complete in the previous years, to transmission AI-based machineries and algorithms from controller experimentations to actual farming environment needs much more trainings and investigate, and to be bright to handle great sets of data and to understand them precisely and rapidly are two main contests that essential to be addressed in command to allow the application; lastly, the refuge of policies used in exposed places of farming atmosphere and the confidentiality of data composed are also difficulties to address. And this analysis pinpoints the development of agricultural robots. First, two samples of his automata intended to perform dissimilar errands in the farming manufacturing are registered. A self- managing mobile robot that can spray a greenhouse with pesticides, a tractor that uses GPS and machine vision and has pre- programmed driving paths, a significant growth promising prospects in this sector. apple-preferred robot that uses a Cartesian control system to find objects, and two. of weeding robots. Something that brings difficulties and revolutions more than a few orders. B. Physical flexibility and the ability to distinguish between crops and weeds, such as apple harvesters with advanced elastic grippers. The analysis then points to challenges in the use of agricultural robots. These challenges float virtually everywhere in the issue of randomness in the use of agricultural robots. The actual atmosphere remains.

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