

An Overview on the Application of Artificial Intelligence in Agriculture

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ABSTRACT: Agriculture is the most systematic word used to describe many types of feeding and other commodities by plants and domestic animals for human beings in the globe. In the field of agriculture, artificial intelligence just appeared. Inappropriate land management, illnesses and infestations of pests, the high demands of data, low productivity, and knowledge gap between farmers and technology are only a few of the problems facing the industry to boost its production. This document contains all information concerning artificial intelligence and farming. The document also includes artificial intelligence techniques, artificial intelligence robotics, artificial neural network architecture, and artificial intelligence agriculture. Factors including such demographic growth, past disasters, changes in food resources, as well as regional major food patterns can indeed be utilized for predicting and researching Artificial Intelligence. This know-how may be used to modify harvesting practices successfully and decrease crop production waste and enhance farmers' revenue.

KEYWORDS: Agriculture, Artificial intelligence, Crop, Farmers, Robots.

1. INTRODUCTION

Agriculture was a central advancement in the growth of sedentary human civilization, as it allowed people to live in cities by creating food surpluses from domesticated species farming. Agriculture is the most expressive term used to describe the various ways in which crops, plants as well as domestic animals provide food as well as other goods to the world's human population. The English term agriculture comes from the Latin words ager (farm) as well as colo (cultivate), which together form the Latin word agricultural, which means "field or ground tillage." However, term come for include a broad range of agricultural practices that have their own descriptive meanings, such as forestry, horticulture, domestication, arboriculture, as well as vegeculture, and livestock management methods such as diverse crop livestock pastoralism, breeding, as well as transhumance. Agriculture is also often qualified by terms like proto, incipient, vast, shifting, as well as intensive, exact meaning of which aren't obvious[1].

Different characteristics, like soil condition, regularity of harvest, as well as primary crop or livestock, are often used to describe specific types of agriculture. The word agriculture is often limited to crop production only, without the raising of domestic animals, but it generally refers to both. Agriculture is described as " science as well as art of cultivating the las well as, including the allied pursuits of gathering in the crops as well as rearing livestock (sic); tillage, husbandry well asry, farming (in the broadest sense)". Agriculture is the foundation of every economy's long-term viability. Although it is important for long-term economic growth as well as systemic change, it varies by country. Agricultural operations used to be restricted to food as well as crop processing.

However, in the last two decades, it has expanded well to include crop as well as livestock harvesting, manufacturing, marketing, as well as distribution[2].

Agricultural activities now contribute in reducing unemployment, supplying raw materials to supplementary sectors and also helping to build the economy as a whole, as a basic livelihood base for the gross domestic product. As the population of the globe increases geometrically, revisiting agricultural methods is more vital than ever to identify new ways of maintaining and improving agriculture. Facilitating artificial intelligence in agriculture, would be other technologic advances, such as big data analytics, the web-service, robots, internet services, cheap sensors, cameras, drone technology as well as extensive Internet coverage, which is geographically distributed[3]. An artificial intelligence system would be in a position, by evaluating soil management sources including such temperature, atmosphere, water, soil and historical crop efficacy, to evaluate which crops can be planted and when the best seed or harvest dates are available in a specific region in the considered period. This improves agricultural yields while reducing water, fertilizer and insecticides consumption. Effect on natural environments can be minimized, as well as worker protection can improve, thanks to the use of AI technologies[4].

Medical science, education, finance, agriculture, defense, as well as a variety of other fields have all been affected by AI. Artificial intelligence implementation necessitates a machine learning method. This leads us to a subdomain of Artificial intelligence known as "Machine Learning." The fundamental goal of machine learning is to input machine data from past encounters as well as theoretical data to solve a certain issue. Technologies nowadays include data analysis based on past data, experience, voice recognition, facial identification, weather prediction and medical diagnostics. Big data and the fields of data science have developed in machine learning to such an extent. Machine learning is a method for creating intelligent machines that is based on mathematics. As Artificial intelligence stimulated, many novel logic as well as methods were created as well as found which make the process of problem. Such methods are listed below:

- Artificial neural networks
- Fuzzy logic
- Expert systems
- Neuro-fuzzy logic

The most popular as well as frequently used tool for such testing of all of these artificial neural networks. The brain is the human body's largest complex organ. Electric impulses flow through axons based on interlinked brain networks through neurons. At the conclusion of each node, the signal is sent across synapses. The neural networks artificial system has been built in line with the other functions of the human brain. To train this specific model, algorithms such as Silva as well as Almeida's algorithm, Delta bar delta, R prop, Dynamic Adaptation algorithm, as well as Fast prop are used. In the operation, 9 neurons were used. Artificial neural networks is a task-oriented approach that instructs the machine to work based on pre-programmed tasks rather than a computationally programmed task as shown in Figure 1. Architecture of ANN contains three layers are given below:

- Input layers

- Hidden layers
- Output layers

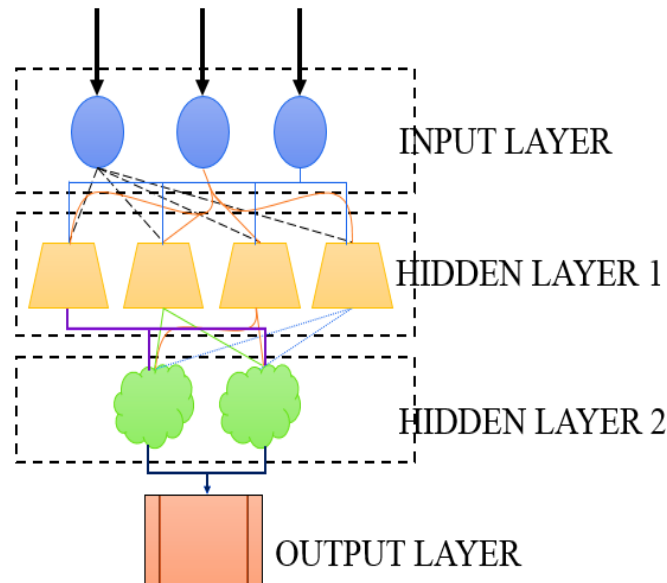


Figure1: Artificial Neural Network Layer having Three Layers Input Layer, Hidden Layer, as well as Output Layers.

The following parameters of the feed forward back propagation mechanism: The input layer is 7, the output layer is 1, the hidden layer is 50, as well as the number of iterations is 1200. In the unseen as well as output layers of the activation layer, sigmoidal functions are used, while the input layer uses a linear function. Furthermore, artificial intelligence as well as machine learning are largely based on assumptions as well as hypotheses[5]. This is where scripting as well as algorithms come in. There should be a hardware-software framework for implementing these algorithms as well as logic-based principles. Embedded devices are the means by which this can be accomplished. Embedded systems are hardware-based systems made up of memory chips that contain proprietary applications (Figure 2). The application of artificial intelligence as well as the expert system in agriculture is a loosely defined topic. Agriculture is a vital component of every country's economy. Currently, China, South Korea, as well as North America are spending trillions of dollars in agricultural production as well as the implementation of advanced technology. The population is rapidly growing, which is directly proportional to the rise in food demands. India has a diverse range of food crops as well as, in particular, species. Agriculture is unique among the most vulnerable areas of Indian economy, as it supports all others areas as well as has far-reaching implications.

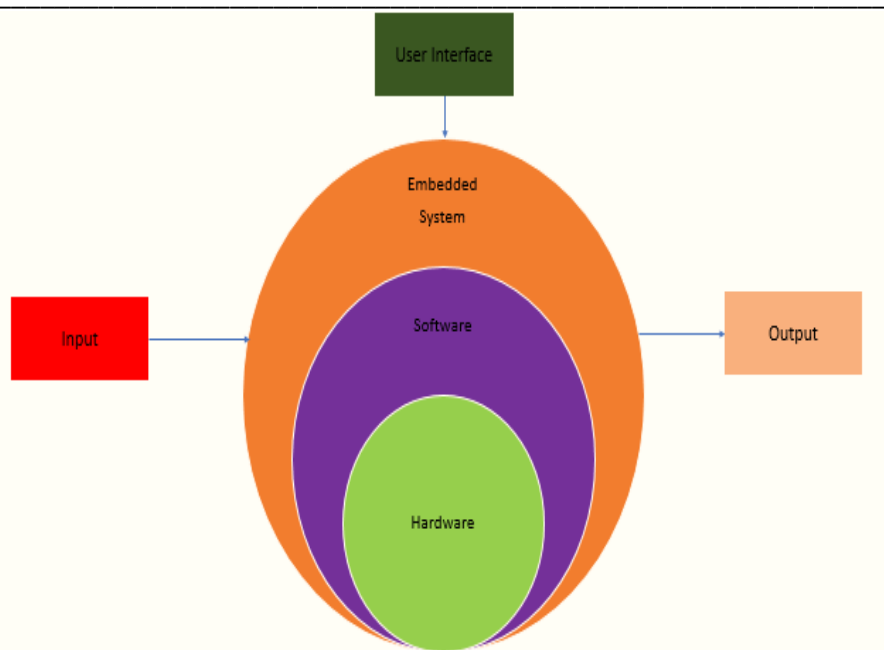


Figure 2: Embedded System having Software, Hardware which Provide Output by Giving User Interface as well as Input.

With the advancement of technology in other sectors, automation in agriculture is becoming increasingly important. By the continued growth of human populations, the demands on agriculture will increase, as well as agri-technology as well as precision farming have become increasingly important in today's world? Digital agriculture refers to use of high-tech computer system to measure various parameter such as weed identification, crop predictions, yield detections, crop efficiency, as well as a variety of other machine learning techniques

- *Robots in Agriculture:*

In major areas of the economy with little efficiency, like agri food, robotics as well as autonomous systems are being implemented. According to the UK RAS White Paper, the UK Agri Food Chains produces over £108 billion a year as well as employs 3.8 million people in a genuinely multinational market that generated £21 billion in export in 2016. In agricultural processing as well as administration, robotics has played a significant role. Since the unorthodox farming machineries were inefficient, researchers have begun focusing on technology to design autonomous agricultural equipment.

The key goal of developing this technology is to substitute human labor as well as provide productive results in both small as well as significant productions. In industry, use of robotic technologies has greatly increased efficiency. Weedinatering, protecting the farm for successful reporting, ensuring that disapproving environmental condition don't impact performance, increasing accuracy, as well as managing individual plants in different unfamiliar ways are all tasks that the robots conduct autonomously. The inspiration for such a technology was inspired by the creation of Eli Whitney cotton gin. Elis Whitney (1762–1823), a U.S.-born inventor, patented

a method for extracting seed from cotton fiber in 1794 that revolutionized cotton production. In one day, it produced 25 pounds of cotton. As a result, autonomous agricultural robots were born. To assess the actual location of seeds, a simple automatic model was implemented. Seed positioning with extreme precision also developed. Mechanisms that guarantee that seed planted have no field velocities. This is important because it means that the seed does not rebound after contact with the soil. Automated computers kept track of the plant's condition as well as progress. Various biosensors have been developed to monitor plant growth as well as detect plant diseases. The manual weeding method was replaced by laser weeding technologies, in which a well as held directed infrared light disturbs the cell of the weed as well as is operated by computers. Automated irrigation systems were also built to make efficient use of water.

- *Irrigation:*

Agriculture uses 80 percent of the world's total freshwater energy. This proportion is steadily rising in tandem with demographic growth as well as rising food demands as well. As a result, we'll need to develop more efficient solutions to ensure that water supplies are well used in irrigation. Auto irrigation scheduling methods have replaced manual irrigation dependent on soil water estimation. When introducing autonomous irrigation machines, the plant evapotranspiration-rate, which is reliant on numerous atmospheric parameters like humidity, solar radiation, wind speed, as well as crop factor like soil properties, stage of development, plant density, as well as insects, was taken into account. Fertility meters as well are set up in the field to detect the percentage of the primary ingredients of the soil, such as phosphorus, potassium, as well as nitrogen, to regulate fertility of soil. Wireless equipment is used to plant automatic plant irrigators on fields for drop irrigation.

That approach preserves soil's stability as well as the efficient utilization of water resources. Smart irrigation technology is being developed to maximize productivity without the use of a large number of people by sensing water levels, soil temperature, nutrient quality, as well as weather forecasting. The irrigator pump is turned ON/OFF according to the microcontroller's instructions. The M2M has been created to make connectivity as well as data sharing between nodes in the agricultural field easier, as well as to the cloud, through main networks. An Arduino as well as Raspberry Pi3 moisture content as well as temperature are detected using an automatic robotic model. Data is collected at regular intervals as well as sent to Arduino microcontrollers, which is attached to edge level hardware, which transforms the analog input to digital. Signal sent to Raspberry Pi 3 which is embedded with the KNN algorithm which then sends it to Arduino to start the irrigation water supply as shown in Figure 3. The resource will supply the water based on the demands well as, as well as it also updates as well as stores sensor value. An automatic irrigation system using Arduino technologies to reduce manpower as well as time usage in the irrigation process.

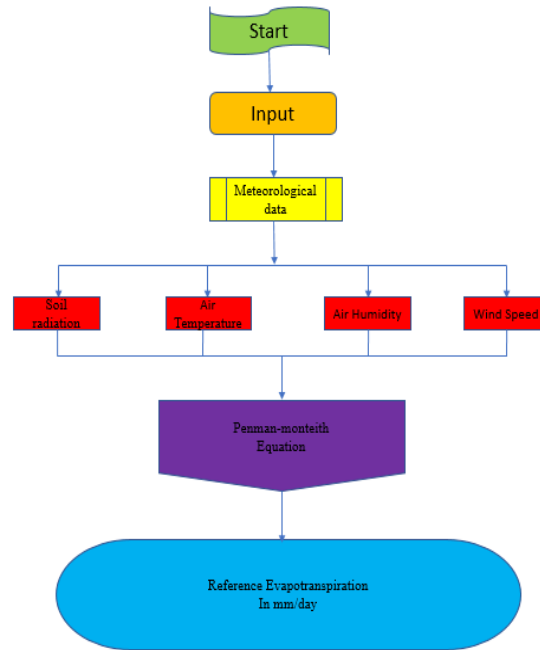


Figure 3: Flowchart for Evapotranspiration in which Show Evapotranspiration by giving the Input.

Another irrigation facility that is automatic. Soil moisture sensors for detect soil moisture, a temperature sensor to detect temperature, a pressure regulators sensor to manage pressure, and a molecular sensors to boost crop growth were all developed for other purposes in this process. Cameras with digital equipment are being installed. The outputs of each of these instruments are converted to digital signals and sent to a multiplexer done a wireless network like ZigBee or a hotspot. Subsurface drip irrigation was the first process, which minimized water loss due to evaporation and deforestation because it was immersed directly underneath the crop[6].

As a result, assume that the device can sense areas of the fields that need more water as well as will prevent the farmers from watering when it rains. Soil moistures sensors are unique devices that can be used to determine the moisture content of soil. It is buried near the crop's root areas. The sensors assist in correctly measuring the moistures level as well as transmitting this information to the irrigation controller. Soil moistures sensor will help you save a lot of water. Water on demand as well as irrigation is a moisture sensor technique in which the setting threshold based on the soil field ability as well as these sensors allow the controller to water only when required. When schedule times come, sensors read the moisture content or level for that zone, as well as watering is only permitted if the moisture content is below the threshold[7]. The additional was suspended loop irrigation, which, different water on demand as well as irrigation, necessitates irrigation time.

2. LITERATURE REVIEW

Z. Ezziane et al. studied the agriculture industry, and the application of Artificial Intelligence was recently visible. The industry has several problems, including low nutrient treatment, disease and

pesticides, large data needs, low production and knowledge gap between agriculture and technology. The sector is facing several challenges. Flexibility, high efficiency, precision and cost-effectiveness are the primary ideas of IA in agricultural production. A discussion of AI applications in soil management, crop management, and weed control and disease management will be presented in this document. The strength and limits and the way expert systems are used for improved productivity are a specific focus[8].

D. Alfer'ev studied the use of artificial intelligence techniques in farming. There are several problems in agriculture, including infestations of diseases and pests, incorrect management of the land, poor drainage and irrigation and many more. This leads to serious crop loss and environmental risks since chemical substances are excessively used. Several studies were carried out to deal with these problems. With its rigorous learning skills, the area of artificial intelligence has become an important method for resolving many challenges in agriculture. Systems to support farmers for better solutions throughout the world are being created. This literature study includes 100 major contributions in which artificial intelligence approaches have been used to address agricultural issues. This article examines artificial smart technology in the primary agricultural sector, so that readers will be able, during the previous 32 years, from 1980 to 2016, to grasp the multifaceted growth of agri-intelligent systems[9].

S. Khairunniza Bejo et al carried a research in agriculture domain. The agriculture system is more complex because there are a wide range of factors in the broad data situation. A number of techniques and approaches were used to detect any interactions among variables that impact crop yields. It is showing promise to use the neural network to solve non-linear and complex systems. This article offers a review of artificial neural systems using different agricultural performance variables to forecast crop output. An outline of the use of the artificial neural network is provided, as well as the general premise of neural network design. The literature has proven the superior understanding of crop variability by an artificial neural network compared with conventional approaches[10].

3. DISCUSSION

The researchers examined and analyzed the applications in fields of artificial intelligence, however they did not explain how artificial intelligence, the concept of agriculture, artificial intelligence benefits robots in agricultural production, etc. This publication contains all the information on artificial intelligence such as a description of artificial intelligence that indicates that the conceptual model of human minds and machines designed to think like men but imitate their actions and that agriculture is the scientific theory, the art or the practice of soil cultivation, crop production as well as cattle raising and soil cultivation is defined as agriculture. This document contains all facts regarding artificial intelligence such as artificial intelligence, agricultural explanation. This article also includes applications of AI, Artificial neural network artificial architecture and artificial intelligence irrigation. This article also includes artificial intelligent network design applications (such as input, output and cloaked layer) along with artificial intelligence irrigation.

4. CONCLUSION

This article describes artificial intelligence as a model of human intellect on machines that are intended to both think and behave identical to humans. Description of farming, which claims that agriculture is science, art, and practice, including farming, crop cultivation and breeding and animal husbandry. In this study, artificial neural networks such as inputs, outputs of cached layers and artificial intelligence irrigation design are included. Human beings or basically human beings are a race which may be used to foreshadow a future of extraordinary diversity, distinct from all other living species. Since the early days, human society has evolved and much of their growth focuses on food gathering and consumption, which makes farming a key part of its basis. Agriculture is a technology, an art and a profession that involves both producing and cultivating plants as well as breeding and cattle. It is the retransmission of energy both for people and for animals and the simplicity of the many food sources of nature. Agriculture is more a part of living than an enterprise in India. Agriculture, like it continues to do now, has long played an essential part in the Indian economy. It is no exaggeration that agriculture is the mainstay of the Economy. Variables such as population growth, historical demas as well as food resources trends as well as regional major staple patterns, among others, are calculated to determine. This information may be utilized to modify crop behaviors effectively and to lower crop yields and enhance farmers' income.

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