The Application of Artificial Intelligence in Agriculture

Baogui Zhao

1Liaoning Agricultural Development Service Center, Shenyang 110034, Liaoning, China

*E-mail: zbgseed@163.com

Abstract. In today's society, data resources have become strategic resources as important as material resources, energy resources and human resources, which is the embodiment of a country's digital subject and comprehensive national strength. The purpose of this paper is to study the application of artificial intelligence in the field of agriculture. It is of great practical significance and practical value for promoting the transformation and upgrading of traditional agriculture and promoting the development of intelligent agriculture. Based on the characteristics of the agricultural field, this paper defines intelligent agriculture, analyzes the process of intelligent agriculture, designs the general framework of agricultural technology, and thinks about the technical route of the development of intelligent agriculture. Then, based on the process theory, the application of acquisition technology, management technology and processing technology in the agricultural field is studied and discussed with specific examples. The results show that the processing rate of large production data is improved by 92.1%. Based on the experimental results, this paper puts forward some opinions on the development of intelligent agriculture, which can provide reference and basis for further promoting the application of artificial intelligence technology in agriculture.

Key words: Agricultural Big Data, Intelligent Agriculture, Data Collection, Data Management, Data Processing

1. Introduction

According to the basic mode and concept of the development of the information industry era, agriculture can take biological information and agricultural knowledge technology as the core elements of agriculture, and integrate modern agricultural information technology with traditional agricultural economy through mobile Internet, Internet of things and cloud computing [1-2]. It has successfully realized a new modern agricultural production mode that covers the whole process of
agricultural production and management with intelligent information visual perception [1-4].

Artificial intelligence is a rapidly developing computer technology that affects every aspect of our lives. It is predicted that artificial intelligence will lead to fundamental changes in practice in many professional fields, including medicine. One of the most important advances in artificial intelligence involves digital imaging and image recognition. Tomer Nawrocki demystifies these terms for radiologists and builds a basic understanding of the subject. Moreover, he also discussed the possible impact of artificial intelligence on the field of radiology in the foreseeable future [5]. In recent years, with the development of artificial intelligence and pattern recognition technology, facial expression recognition technology has attracted extensive attention. Most studies are based on 2D images, and their performance is often computationally expensive. Qirong MAO proposed a real-time emotion recognition method based on 2d and 3d facial expression features captured by Kinect sensor [6]. Handwritten character recognition is a way to enable a computer to automatically recognize characters or scripts written in the user's language. Today, optical character recognition has become one of the most successful applications of pattern recognition and artificial intelligence. Here, a handwritten English character is scanned, and the image is fed into a computer, where it is recognized using a neural network and translated into the same work as the equivalent printed character. J.p. Ananth developed a near-combination algorithm for each process [7].

Based on the latest development of artificial intelligence technology in the field of agriculture, this paper conducts an in-depth study on the current issues of intelligent development of agricultural management, so as to provide practical thinking and theoretical reference for the further strengthening of intelligent development of intelligent agriculture [8-9]. Then, it systematically analyzed and studied the relevant research achievements of current artificial intelligence technology, and made a preliminary study and exploration on its practical application prospect in the field of modern agricultural science and technology by combining specific application examples [10].

2. Proposed Method

2.1. Intelligent Agriculture

The main research direction of intelligent modern agriculture is to carry out the comprehensive application research of artificial intelligence in modern agriculture according to the technical characteristics of different intelligent agricultural application fields. Agricultural information processing technology driven by agricultural big data and guided by agricultural knowledge; Intelligent optimization of strategic decision for multiple strategic objectives, intelligent optimization of decision processing technology for incomplete accurate information download, etc. Robust control processing technology based on intelligent coordination; The research and development of cloud computing robots and other collaborative automatic computing processing methods, using the professional knowledge generated by man-machine cloud automatic computing to provide an important basis for the long-term rational optimization of the operation and application of intelligent agricultural robots; Research and development of man-machine animating system and other autonomous optimization of cooperative control.

2.2. Application of Artificial Intelligence in Agriculture
Based on the properties and forms of geometric linear discriminant functions, classifiers can be divided into linear discriminant functions and nonlinear discriminant functions. Because the various mathematical methods involved in the geometric linear discriminant function classifier are easy to be understood and realized on traditional computers, they are widely used in computer and image pattern recognition. Suppose that each schema class is represented by an average vector:

$$m_j = \frac{1}{N_j} \sum_{x \in S_j} x, j = 1,2, \ldots, M$$

(1)

Where $N_j$ represents the number of patterns in class $S_j$. The way to classify an unknown pattern vector is to assign the pattern to the closest class. Euclidean distance is used to determine the degree of proximity, then the problem is transformed into distance measurement:

$$D_j(x) = \|x - m_j\|, j = 1,2, \ldots, M$$

(2)

3. Experiments

3.1. Experimental Background

As a large developing country of modern agriculture, China has always attached great importance to the construction of a national system of modern agricultural science and technology innovation sharing resources and big data sharing resources. Artificial intelligence technology can be widely applied to the vast field of agriculture, with a vast base of agricultural data. With the extensive application of various new intelligent agricultural sensors and terminals in modern agriculture, agricultural policy data and information sources are becoming more extensive. It will be of great significance to make Suggestions on issues such as food security coordination in developed countries, employment coordination of rural and agricultural labor forces, and agricultural development coordination between urban and rural residents.

3.2. Experimental Design

In this experiment, VMWare virtual machine was used to configure the hardware parameters: 4GB of memory, eight-core CPU, and the installed operating system version was Red Hat Enterprise Linux Server release 6.4. Import data into mysql database; To avoid scrambled codes, utf8 data format: set names utf8; The source resource. SQL. Log in the database, view the table structure with jieba software package, use Python to read the fields in the data table, the data of the title column for word cutting processing; In the semi-automatic installation mode, download the jieba-0.38 installation file and unzip it to run python setup.py install. Some simulation results are shown in Table 1.

| My ISAM engine | Run Python code on Spark |
|----------------|-------------------------|
| -              | Run the python code     |
|                | Single-core             |
|                | Dual-core               |
|                | Eight nuclear           |

Table 1. Simulation results
| Records       | Program 1 | Program 2 | Program 3 | Program 4 |
|--------------|-----------|-----------|-----------|-----------|
| 100000       | 0.19s     | 0.18s     | 0.18s     | 0.18+s    |
| 300000       | 0.57-s    | 0.55s     | 0.55+s    | 0.55s     |
| 750000       | 1.42-s    | 1.38+s    | 1.38s     | 1.38+s    |

4. Discussion

4.1. Application Technology Analysis Based on Artificial Intelligence in Agriculture

A comparative experiment was conducted using python_mysql.py and masterlocal python_mysql.py, respectively, to record the time spent in processing 100,000, 300,000 and 750,000 pieces of data, respectively. Each program is executed 5 times. The highest and the lowest are removed. The remaining 3 Numbers are averaged and the results are obtained as shown in Figure 1.

![Figure 1. Agricultural data processing rate under artificial intelligence technology](image-url)

As can be seen from the above figure, the data recognition rate improved by 92.1% after using MySQL database. My ISAM is the ISAM extension format of MySQL and the default database engine. It is suitable for infrequent inserts, very frequent queries, and low utilization of memory and storage resources. But My IASM does not provide support for database transactions, nor does it support row-level locking and foreign keys, so it is less efficient to lock the entire table when INSERT or UPDATE data is being written. Unlike InnoDB, however, My IASM stores the number of rows in the TABLE, so SELECTCOUNT (*) FROM TABLE only needs to read the saved values directly, instead of a full TABLE scan. If the table has far more reads than writes and does not require database
transaction support, My IASM is also a good choice. From using shallow level calculation to using deep learning neural network reasoning; From relying solely on traditional data analysis thinking model to machine learning based on systematic guidance of data analysis specialty; From task data driven ai learning in professional fields to ai learning under general technical conditions. The application of modern artificial intelligence information technology in the in-depth study of data, there are a large number of space problems with uncertainty and fuzziness, to explore the complex multi-dimensional nonlinear space problems specific solutions, etc., to accelerate the implementation and development of artificial intelligence modern agriculture has created a lot of favorable conditions; Fully application of artificial intelligence technology, can effectively help from is closely related to China's agricultural production and operation process of agriculture data and application of spatial data quickly find out the basic rule of some hidden, reasonable establishing correct according to the rule of precision agriculture development strategy in our country, and precision agriculture forecast in time, to prompt China's agricultural science and technology production sustainable, efficient, coordinated and healthy development of the important purpose, but we should development of modern agriculture of artificial intelligence management must be one of the important theoretical basis.

As shown in Figure 2, S4 provides a runtime distributed platform for handling communication, scheduling, distribution, and so on between different containers. The distributed container is called an S4 node. S4 nodes are deployed on the S4 cluster; User-developed applications are deployed on S4 clusters; The application performs like a directed graph, including the processing units PE (processingelement) and Stream. Processing unit PE is the basic data processing unit of S4, which is composed of functions, event types, primary keys and key values. Events flow between the processing unit PE to form the data flow of S4. The agricultural e-commerce platform similar to the artificial intelligence technology can be used for online marketing, which maximizes its own advantages to integrate agricultural information technology resources efficiently through the marketing integration mode, reduces the production cost of physical agricultural products, and improves the relationship between product suppliers and physical farmers. For example, agricultural e-commerce platforms such as agricultural smartphone app app and WeChat are adopted to establish an online trading platform for agricultural products. At the same time based on intelligent iot and intelligent mobile network technology to our country agricultural product production, circulation and so on the whole process of quality information collection and management and the quality of agricultural products market in China continues to back service management, management of agricultural products safety production process files back, based on mobile web and intelligent mobile phone short message service platform of quality and safety of agricultural products market in China continues to back service system, which can realize agriculture to the product quality and after-sales service continued back, promote sustainable resource in our country industry brand effect of all kinds of agricultural products, ensure quality and safety of agricultural products market in China.
Figure 2. Comparison of agricultural product data streams under different platforms

To sum up, facing the current major development needs of modern agriculture in our country, should actively explore promoting agricultural artificial intelligence intelligent agricultural technology with traditional agricultural science and technology crossover technology fusion depth fusion, building a modern agriculture of artificial intelligence with the characteristic of agricultural system key technology products, application solutions system, service system, change the traditional agriculture in the traditional mode of production, promoting the modernization of intelligent agricultural production. In intelligent the needs of the rapid development of modern agriculture, increase investment in scientific research, carry out various kinds of intelligent major key technology products research and development, the modern agriculture intelligent modern agriculture major key technology to create products, mainly including intelligent agricultural crops intelligent environment perception, intelligent process control, independent operation, intelligent integrated services such as key technology innovation products. Based on the market orientation of customer demand, it actively develops the application of intelligent integration system of key technologies of intelligent green agriculture, including intelligent agricultural farm, greenhouse, orchard, pasture, fishery, intelligent production workshop for agricultural product processing and intelligent green agricultural supply chain. The development potential of artificial intelligence is very huge. Its extensive application in China's modern agriculture will further greatly improve China's modern agricultural production informatization management level and improve the social and economic benefits of modern agricultural technology production, which is an important long-term development strategic direction of China's modern agriculture. Now our country artificial intelligence technology researchers are working hard, in the near future, artificial intelligence technology must be able to better serve human life, it will greatly improve the daily life, bring huge economic social and economic benefits. Under its strong guidance, agriculture will step into the modern intelligent new development era.

4.2. Suggestions Based on the Application of Artificial Intelligence in Agriculture
With the popularization of the Internet, the penetration of sensor network, the emergence of big data, the interaction and cross-fusion of data and information in human society, physical space and information space, and the profound changes in artificial intelligence have taken place. At present, artificial intelligence has entered a new stage of accelerated development. It has increasingly become a new focus of international competition, a new engine of economic development and a new opportunity for social construction. Its development will also profoundly change human social life. In terms of agricultural biotechnology research, there is a gap between China and foreign countries, that is, more consideration is given at the strategic level and less at the tactical level. There is a lot of duplication and little independent innovation. Compared with foreign countries, China's scientific research projects have not fully considered the complexity and uncertainty of life, which are the characteristics of agricultural factory production.

Plant factory production is a typical CPS (Cyber Physical System) Physical information fusion System, it involves part of artificial intelligence is mainly manifested in four aspects: information perception and cognition, decision (integrated multi-objective optimization decision-making), control (light temperature humidity gas robust coordinated control of many factors such as water), automatic production operation (autonomous coordination control and the production line and robot). Without the support of relevant knowledge and models, the dynamic prediction of crop and its environment changes cannot be realized, nor can the multi-objective comprehensive optimization decision (such as the optimization decision of energy conservation and consumption reduction) be made, nor can the robust and automatic production operation control of multiple factors such as light, temperature, humidity, air, water and fertilizer be realized.

5. Conclusions

In this paper, by analyzing the current present situation of the application of artificial intelligence technology in the field of agriculture, puts forward the research in the field of artificial intelligence technology in the agricultural application of proposition, fully analyzed the artificial intelligence technology to traditional agriculture transformation and upgrading of the great historical opportunity, to stand in the Angle of the national intelligent agricultural development, to our country agricultural development of informatization, digital problems for further research and thinking, and through the experiment on the application of artificial intelligence technology in the field of agriculture.

References

[1] Roopaei M , Rad P , Choo K K R . Cloud of Things in Smart Agriculture: Intelligent Irrigation Monitoring by Thermal Imaging[J]. Cloud Computing IEEE, 2017, 4(1):10-15.

[2] Wu H T , Tsai C W . An intelligent agriculture network security system based on private blockchains[J]. Journal of Communications and Networks, 2019, P99(99):1-6.

[3] Jeavons, Andrew. What Is Artificial Intelligence?[J]. Research World, 2017, 2017(65):75-75.

[4] Morav?iik, Matej, Schmid M , Burch N , et al. DeepStack: Expert-Level Artificial Intelligence in No-Limit Poker[J]. ence, 2017, 356(6337):508.

[5] Nawrocki T , Maldjian P D , Slasky S E , et al. Artificial Intelligence and Radiology: Have
Rumors of the Radiologist's Demise Been Greatly Exaggerated[J]. Academic Radiology, 2018, 25(8):19.

[6] Mao Q , Pan X , Zhan Y , et al. Using Kinect for real-time emotion recognition via facial expressions[J]. Frontiers of Information Technology & Electronic Engineering, 2015, 16(4):20-22.

[7] Ananth J P , Raghuraman G , Cyril G L I , et al. Enhancement of Segmentation and Zoning to Improve the Accuracy of Handwritten Character Recognition[J]. Journal of Computational and Theoretical Nanoscience, 2015, 12(12):5891-5894.

[8] Ghahramani, Zoubin. Probabilistic machine learning and artificial intelligence[J]. Nature, 2015, 521(7553):452-459.

[9] Davis E , Marcus G . Commonsense Reasoning and Commonsense Knowledge in Artificial Intelligence[J]. Communications of the Acm, 2015, 58(9):92-103.

[10] Rigas E S , Ramchurn S D , Bassiliades N . Managing Electric Vehicles in the Smart Grid Using Artificial Intelligence: A Survey[J]. Intelligent Transportation Systems, IEEE Transactions on, 2015, 16(4):1619-1635.