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# Research on Image Recognition Technology Based on Artificial Intelligence

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**Abstract:** With the rapid development of China's economy in recent years, the Internet and computers are becoming more and more popular, and they play a great role in our lives. At present, image recognition technology is widely used in various fields such as work, life, and learning, and various industries have also achieved more efficient development due to artificial intelligence image recognition technology. By analyzing and studying the technical principles of image recognition, the advantages of its intelligence, convenience, and practicality were elaborated. The main workflow of image recognition technology was analyzed, and the key technologies in its workflow were explained in detail. Finally, the development prospects of artificial intelligence image recognition were discussed, hoping to bring more practical value to the development and application of image recognition technology.

**Keywords:** Artificial intelligence; Image recognition; Pretreatment; Technology.

## 1. Introduction

With the rise and development of the intelligent revolution, image recognition technology has made significant breakthroughs and has been widely applied in fields such as healthcare, finance, and transportation, promoting innovative development in various industries. It not only brings convenience to people's lives, but also reduces the workload of related industries and improves industry production efficiency. Nowadays, with the assistance of computer technology and intelligent development, image recognition and processing technology has become more and more widely used in various scenarios, and its functions are becoming increasingly powerful.

## 2. Basic Principles of Image Recognition Technology

Developing the image recognition capability of artificial intelligence devices is a major core of researching intelligent devices. The image recognition function captures various features on the object to be recognized by simulating the physiological state of human eyes when distinguishing things. Therefore, in order to identify things, the most important thing is to conduct a comprehensive scan of the identified object, and then make judgments based on its characteristics. Taking the letter as an example, the main feature of the letter A can be described as having a prominent sharp corner at the vertex, the feature of the letter O as a circle, and the feature of the letter Y as having a sharp angle with an opening upwards.

Nowadays, image recognition technology is very common and often used in daily life. For example, when logging into various banking apps, facial recognition is required to verify the user's identity information and ensure the security of their property; The parking lot utilizes image recognition technology to achieve intelligent management. When vehicles enter and exit the parking lot, the intelligent scanning equipment at the entrance and exit of the parking lot can accurately recognize the license plate number, reducing the work pressure of parking lot management personnel and making it more convenient for everyone to travel. The current image recognition technology is no longer limited to external prominent feature analysis, but can also recognize special information such as the color of the object, which is closer to the function of the human eye. According to relevant needs and usage scenarios, the content of the identified object can be deeply analyzed, and this function has a broader application scenario. At the same time, with technological breakthroughs, researchers are constantly making breakthroughs in image recognition, striving to obtain functions comparable to those possessed by the human eye, continuously enhancing the accuracy of recognition. Not only do they need to have strong scanning capabilities to simulate the process of human eye recognition of images, but they can also use computer systems to create functions comparable to the processing of image information by the human brain.

## 3. The advantages of artificial intelligence image recognition technology

### 3.1. With intelligent characteristics

From the practical application of image recognition, artificial intelligence image recognition technology adopts the most core technology, utilizing artificial intelligence to recognize images. Compared to traditional image recognition technology, it not only increases the accuracy of processing, but also can directly analyze and filter the content information of the recognized image, enhancing the accuracy of the decomposition results.

At present, image recognition is widely used in facial recognition. Artificial intelligence devices are used to compare the collected facial image information with the stored facial information in the database. When this technology is applied to password security recognition information, it can accurately identify whether the currently obtained information is the person. This technology is used in mobile facial recognition unlocking and facial payment, etc.There are significant application achievements in the field,

and artificial intelligence devices convert facial information into recognition passwords, greatly facilitating the user experience. Artificial intelligence image recognition needs to process many complex information, which is not easy to study. Artificial intelligence devices can process a large amount of information and have high difficulty. Therefore, not only can they perform simple automated processing on images, but they can also dig out various information contents in images more deeply according to the needs of recognition applications, which is more conducive to image recognition applications in various environments, The data information processing technology relied on for this analysis, research, and comparison is far from being comparable to traditional computer image recognition.

### 3.2. More prominent convenience and practicality

The main advantages of artificial intelligence image recognition technology are not only intelligence, but also convenience and practicality. Nowadays, image recognition technology has been widely applied in various scenarios, and it can be seen everywhere in people's daily lives. Various image recognition scenarios derived from artificial intelligence image recognition technology can process previously considered complex and massive information more efficiently and quickly, using shorter time to complete more difficult data processing tasks, greatly shortening the image processing process. For example, facial payment and facial password verification, which are commonly used nowadays, allow consumers to quickly complete the payment process by scanning their faces with an intelligent device camera without entering a payment password. The security system developed by artificial intelligence image recognition technology has higher security and convenient protection capabilities than traditional password protection.

## 4. Process Analysis of Image Recognition Technology for Artificial Intelligence

### 4.1. Preprocessing image data

An important aspect of artificial intelligence image recognition technology is image preprocessing, which directly affects the accuracy of subsequent image recognition. In addition, the key information obtained from image recognition and the final recognition results generated by analyzing and comparing the information are closely related to the preprocessing stage. By combining image preprocessing and intelligent recognition, it is possible to accurately and quickly scan the identified image in all directions, capture the feature data information of the identified object, and store it in a database, preparing for future image recognition judgments and laying a solid foundation. By preprocessing images, the technical processes required for artificial intelligence in image recognition can be reduced, resulting in a decrease in the the difficulty and complexity of recognition shorten the time required for recognition. Preprocessing images can greatly improve the recognition efficiency of artificial intelligence image recognition.

### 4.2. Extracting typical features of images

The core process of ensuring accurate extraction of image features lies in selection and extraction. All things in the world have their own characteristics, and each of them has a corresponding specific subset of features in artificial intelligence recognition systems. The ability to select scientifically reasonable feature points for image recognition is a solid foundation for ensuring the complete and accurate final image recognition effect. Analyzing the current application scenarios of most artificial intelligence image recognition, it can be seen that the main features of the recognition object are image shape, color, texture, and spatial relationships of the image. Usually, in image recognition, the color of the recognized object is taken as the top priority feature to capture, and then feature information such as space and volume of the recognized object is obtained. But using image recognition as when applying specific technologies, it is more important to consider the usage scenarios and the goals that the technology aims to achieve, in order to set specific recognition priorities. Analyzing each image from different perspectives contains a considerable amount of information, therefore in order to achieve accurate image recognition results, it is necessary to classify and divide the features of the image. For example, when power companies use image recognition technology to inspect transmission lines, the main task is to obtain the texture features of the transmission lines, and at the same time, develop special inspection plans based on the needs of maintenance work to reduce the complexity of line inspection work and improve work efficiency. In this scenario, it is necessary to input various problematic circuit and cable texture features into the artificial intelligence image recognition library, and match them during image recognition to improve the accuracy of line recognition, improve the accuracy of circuit inspection, and reduce safety hazards.

### 4.3. Image matching classification

The final key program of artificial intelligence image recognition is to match and classify the recognized images. This key workflow is based on image preprocessing and extracting the main features of the image. The data information obtained from the first two steps needs to be used as reference information for image matching and classification. During recognition, the same image information from the recognition database is obtained for feature comparison and analysis. Taking the patrol inspection of power transmission and distribution lines identified by power corporate identity as an example, when recognizing the pictures of power transmission and distribution lines, the same data information as the identified object is obtained in the image matching classification for matching and classification processing. The identification on the drawing provides the main data support for analysis and judgment, and strengthens the matching rate of image recognition.

## 5. The Application Path of Artificial Intelligence Image Recognition Technology

### 5.1. Model recognition method

Traditional image recognition technology requires processing a large amount of information, with complex processing processes and long recognition time, while model recognition method is improved and designed on the basis of traditional recognition methods. The model recognition method requires obtaining mathematical information such as curves, numerical values, and shapes on the recognition graph,

and completing image recognition based on mathematical models and principles.

The most crucial aspect in this model is learning, which builds a complete image information database during the learning process as a data support for subsequent analysis, extraction, and recognition of images. Similarly, in the application process of model recognition method, it is inevitable to encounter situations of untimely and inaccurate recognition, especially when a comprehensive database is not established during the learning process, which can greatly affect the recognition results of images. In the medical field, image recognition techniques such as synthetic resonance imaging and X-ray transmission imaging are applied in medical equipment and experimental detection scenarios through model recognition methods.

## 5.2. Neural network form

There are currently four most common forms of neural networks, namely feedback networks, feedforward networks, hybrid networks, and interconnected networks. Of course, the composition of different network forms is also different, and they also have different characteristics. For example, feedforward networks have a multi-layer structure, where neurons between adjacent layers are interconnected, while neurons within the same layer cannot be interconnected. Neurons from the previous layer input to the next layer, transmitting layer by layer to each neuron in the following layers. And each node of the feedback network can simultaneously receive input signals and feedback from other nodes, and even receive surround feedback from signals already output by neurons. Using this god in the field of transportation. Figure 5.1 shows the basic structure of a neural network. Figure 5.2 shows the basic structure of the LeNet network. Figure 5.3 shows the basic structure of the VGG network, both of which are classic neural networks.

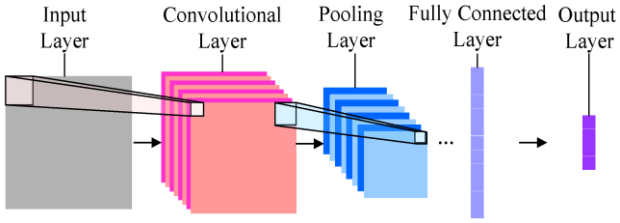


**Fig. 5.1** Basic Structure of Neural Networks

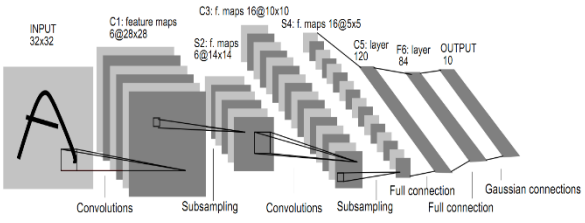


**Fig. 5.2** shows the basic structure of the LeNet network

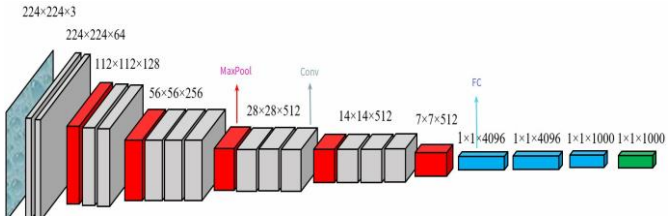


**Fig. 5.3** shows the basic structure of the VGG network

# 6. The Application of Artificial Intelligence Image Recognition Technology

## 6.1. Product Identification

Product identification refers to the identification of goods through the analysis of images, which greatly improves the circulation efficiency of goods. In many scenarios in daily life, product identification technology is applied. For example, checkout is different from traditional checkout methods. Nowadays, cashiers do not need to remember the specific prices of each product. They only need to scan the barcode of the product to complete checkout, which can improve checkout efficiency and reduce the complexity of the cashier's work. Many supermarkets now have self-service checkout machines, allowing customers to checkout on their own; Book borrowing used to require registration when borrowing books, and it was also troublesome to search for borrowing information in the registration book when returning books. Image recognition allows users to self process borrowing and returning transactions by scanning the barcode of the book on the machine.

## 6.2. Face Recognition

Face recognition is essentially a biometric technology that utilizes facial information for identity recognition. Mainly by collecting images and videos containing faces for detection and analysis, facial recognition and identity information confirmation can be achieved. It is still common to use facial recognition technology in daily life. For example, using facial recognition to carry out attendance work, many companies will establish or introduce attendance systems. Facial recognition can improve the efficiency of attendance recording and greatly reduce cheating; By using facial recognition for payment, users can bind their facial information with payment software, and complete the payment without presenting a bank card. This not only improves payment efficiency, but also effectively ensures the security of account funds; When applied to gate channels, airports, train stations, high-speed rail stations, and other occasions, facial gate machines can be used to determine the identity of passengers, which is convenient for management and ensures safety.

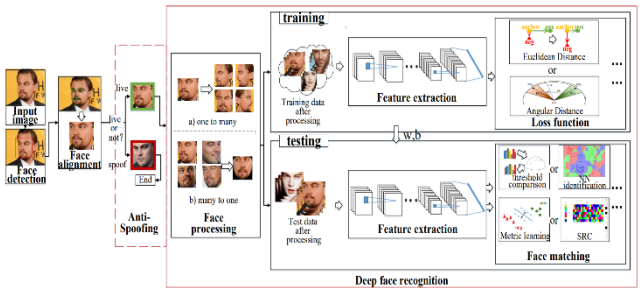


**Fig.6** Deep FR system with face detector and alignment

# 7. Conclusion

With the advancement of network technology, information technology, and communication technology, image recognition technology has also made significant progress, continuously optimized and upgraded. Image recognition technology has a wide range of applications in real life, with various forms of application, but there is still significant room

for improvement. However, it is undeniable that with the development of technology, artificial intelligence image recognition technology will become more precise and powerful, and will bring very prominent positive impacts to various industries in society. Based on this, relevant industries need to seize the technological dividends of artificial intelligence, layout as soon as possible, and use this to promote the development of their own industries development.

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