

Research on Image Recognition Technology Based on Machine Learning

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Abstract: With the rapid development of artificial intelligence technology, the network image recognition technology of machine learning is intelligent and production and life in computer vision system technology in China have gradually achieved significant success. On this basis, the computer network image recognition system is constructed by machine learning with image features such as cross-verification, fitting, accuracy, feature selection, and dimensionality reduction, and the results show that the machine learning algorithm improves the stability and multi-domain application of computer image recognition through cross-verification and deviation of decision tree units. Recognition technologies such as feature vector extraction, edge information, and texture features of machine learning algorithms improve the accuracy of image recognition.

Keywords: Artificial intelligence, Machine learning, and image recognition.

1. Introduction

Artificial intelligence technology has been popularized in all fields of society, which not only brings convenience to people's production and life but also promotes social and economic development. Artificial intelligence technology is relatively comprehensive, including advanced technologies such as computers and networks, and integrates engineering technology and mathematical sciences. In order to give full play to the value of artificial intelligence technology, research in the field of artificial intelligence should make the operation of machines fit the human mind, recognize and understand the world based on the human level, and analyze, think and solve problems like humans.

Electronic devices such as smartphones and digital cameras are becoming more popular, and people have more and more means to acquire images. How to extract useful feature information from a large number of images and then distinguish the images has become very important. At the same time, with the maturity of artificial intelligence technology and automatic recognition technology, more novel and advanced machine learning algorithms (such as random forest, etc.) have been rapidly applied to image recognition technology, so this algorithm plays an important role in the process of digital image automatic recognition. Compared with traditional network image recognition technology methods, machine learning algorithms collect a large amount of simple unit information of images, and have the capabilities of distributed structure storage, processing, classification, comparison, and automatic recognition and learning. Secondly, machine learning automatic recognition technology, with its own unique nonlinear image data information processing capabilities, effectively makes up for the shortcomings of computer artificial intelligence in the intuitive recognition of images, and nonlinear data information adaptation ability[1], while computer image processing and recognition technology based on machine learning algorithms effectively shorten the efficiency value of traditional image recognition specific data information, not only improves the computing ability of related image data but also expands the application scope of image recognition technology.

In summary, this study uses machine learning algorithms with high efficiency and high accuracy as the basis for image recognition technology and applies them to network image recognition systems through neural network intelligent control, feature vector extraction, recognition, information combination optimization, and classification, on the one hand, to enhance the correct probability of digital image recognition, and on the other hand, to make the intelligent image recognition function more systematic and comprehensive. In this way, by analyzing the accuracy of machine learning image recognition, feature vectors, and other indicators, it provides a certain scientific reference value for the design, implementation, and application of a machine learning image recognition system.

2. Image Recognition Principle Exploration Analysis of Machine Learning

2.1. Analysis of the design principle of the overall architecture of the system

At present, in the field of intelligent technology research, image recognition system technology is extremely critical to improve the accuracy of image interpretation and solve the practical problems of image feature pixels. On this basis, this study constructs an image recognition system with machine learning algorithms with excellent fitting, bias, and cross-verification accuracy. Under the machine learning mode, the image recognition system mainly detects and recognizes patterns through two types, one is through image data preprocessing, image feature information extraction and classification output process, the category recognition mainly uses the relevant feature vectors in the collected image information for analysis and judgment, and outputs the same category through the classifier unit, which effectively improves the accuracy of image classification and image recognition; On the other hand, the machine learning algorithm learns the simulated image feature vector index through its own training set and test set, and in the process of detection and recognition, the image information is divided by specifying the standard learning sample set, and the image feature vector values are extracted from different learning

samples, so as to accurately complete the image recognition learning task by simulating the image dataset with similar algorithms through the standard test set determined by the learning sample.

To carry out machine learning around the field of artificial intelligence to ensure the smooth development of the operation, we can start from environmental adaptability, build a feedback evaluation system, expand the knowledge base, etc., as follows: (1) Machine learning from the perspective of environmental adaptability. There are huge differences between humans and machine learning, the most prominent of which is environmental adaptability. Therefore, in the field of artificial intelligence, it is necessary to focus on environmental adaptive machine learning. In machine learning, to achieve the desired results, it is necessary to create the right environment to improve the timeliness of the artificial intelligence system. At the same time, environmental adaptability also has a great role, that is, to establish a preservation system of internal system with reference to this. However, the environment is not always unchanged, both complex and changeable, it is necessary to have a huge amount of data information during machine learning to support, delete irrelevant programs, eliminate various interference and adverse factors, and constantly summarize and promote, as a benchmark to provide guidance for research and development in the field of artificial intelligence. The use of this method increases the complexity of machine learning and affects the stability of artificial intelligence systems. (2) Construct a machine learning feedback evaluation system. In machine learning, the most important task is to build a feedback evaluation system, which includes many contents, such as basic feedback and evaluation, which has a certain complexity, mainly reflected in the variety of concepts[1]; When constructing a strategic analysis and evaluation system, it is necessary to establish a corresponding evaluation system and apply it rationally and scientifically. It is worth noting that in the application of related content, it is necessary to consider the real situation and complete the relevant tasks step by step. In addition, ensure the openness and transparency of the evaluation system, including the implementation process of the system and the obtaining of results. (3) Expand the machine knowledge base and extend. In the implementation process of machine learning, it is very important to scientifically set up the machine knowledge base, which is rich in variety and expression, covering feature vectors, network associations, etc. To achieve this goal, the machine knowledge base needs to be expanded to improve the effectiveness of machine learning. It should be noted that during the expansion of the machine knowledge base, the relevant content should also be expressed, that is, the expression pattern should be constructed, the logic of the pattern should be simple and clear, and the meaning should be clear to reduce the computational cost[2]. The calculation must ensure that the reasoning process is simple and easy to understand, which can not only improve the efficiency of reasoning but also expand its malleability. The malleability here is mainly from the knowledge level to achieve the goal of maximizing knowledge extension.

2.2. Machine learning computer image recognition technology analysis

In the early stage of computer image recognition, it has the advantages of information storage, compressibility, and low image distortion rate, but with the continuous progress of

modern science and technology, computer image recognition has gradually expanded in the direction of intelligence and artificialization, and gradually formed a multi-type (machine learning, genetic algorithm, neural network, etc.) image recognition technology, among which, neural network technology is extremely critical in image recognition technology, which is mainly through the construction of reasonable mathematical prediction models, through the input signal linear weighting, The summation and threshold method analyzes the basic properties of image structure, that is, the extraction and selection of relevant image information feature vectors in a new image recognition technology. Firstly, the image samples are learned and trained to reduce the error range when comparing and extracting feature vectors, and secondly, the image recognition process is carried out through the decision tree unit distribution, which improves the stability of the image recognition process on the one hand, and improves the recognition effect and accuracy on the other hand. At present, computer image recognition based on machine learning algorithms is widely used in many fields (such as image batch processing, and traffic dispatch management), for example, in traffic dispatch management, machine learning image recognition after extracting feature vehicle information, classification, and comparison analysis, and through the vehicle storage database, quickly obtain vehicle information of different feature vector indicators, so as to carry out image data processing through classification units, so that it can obtain image feature information in time and improve the ability of actual life management and control.

3. Design and Implementation of Computer Machine Learning Image Recognition Technology

3.1. Machine learning algorithm design

With the continuous improvement of the role of the image recognition field, the rational application of high-level and all-around intelligent machine learning algorithms is extremely critical. The machine learning algorithm is a comprehensive distributed mathematical model algorithm involving multi-domain interdisciplinary disciplines (probability theory, statistics, convex analysis, etc.), machine learning extracts feature vectors for image input features through extracted feature subvectors, and extracts the feature vectors of the target image for multiple simulation classification and recognition prediction, and on this basis, the computer network image recognition and classification process is carried out through image digital feature information, which compresses and reduces the original machine learning model volume of standard image information data as much as possible. Thus, the standard model of compressed training (repeated testing through training and test sets) is deployed in the computer image recognition center to achieve efficient, accurate, and scientific image recognition, comparison, classification, and storage.

In order to further grasp the core content of machine learning algorithm design in image recognition, this study first explores the artificial neural unit of machine learning and finds that when a single neural unit accepts input information from other neural units in the process of learning to recognize feature vectors and outputs information cross-validation, analysis and classification through information, the information features are transmitted to a single neuron for systematic mathematical analysis, and a mathematical model

system analysis mode of the perception layer, output layer and hidden layer of the machine learning algorithm is formed.

The perceptual mathematical model constructed by the machine learning algorithm improves the analysis of image feature vectors and enhances the image recognition accuracy of computer networks.

3.2. The basic flow of image recognition processing by machine learning methods

Since this paper is designed to build an intelligent computer network image recognition system based on machine learning methods, it is extremely important to reasonably select the feature vector of the detection image to improve the detection and recognition accuracy when performing single image recognition. In this paper, in the process of image feature selection, the correlation is first preliminarily processed, that is, the single-dimensional feature correlation score is realized by the selected network image feature filtering, and secondly, the threshold filtering[2] analysis and processing is carried out to remove the poor correlation or redundant feature vectors in the computer network image recognition process. Finally, after threshold filtering, the selected single-dimensional feature vector is combined in the machine learning algorithm, multiple sets of features are predicted by empirical model evaluation and analysis, and the strongly correlated feature combination is selected as the basic feature vector of the image for identification, detection and learning analysis in this paper.

However, at present, in the process of machine learning image recognition, there are often problems such as difficulty in feature recognition training and low accuracy caused by high data dimension, on this basis, after analyzing the relevant image recognition system[3] through multi-angle and multi-theory, this paper designs to build a mathematical model based on principal component analysis to realize feature data analysis, and then improve the recognition accuracy and reduce the dimensional disaster in machine learning by image feature Dimensionality reduction. Among them, Dimensionality reduction has two basic characteristics: (1) optimize the data structure, realize data visualization, and facilitate data analysis and exploration; (2) Optimized feature training and prediction in the process of machine learning. Therefore, with the help of the Dimensionality reduction feature principle and covariance matrix as the basic basis, this paper decomposes the features of computer network images, realizes the mapping of feature data in high-dimensional space to low-dimensional space, and improves the efficiency and accuracy of machine learning.

3.3. Image recognition processing process analysis

At present, the image recognition system obtained by intelligent machine learning, according to the information recognition technology and processing type, is divided into neural network image recognition technology and nonlinear dimensionality reduction image recognition technology, among which nonlinear dimensionality reduction computer image recognition is mainly for the exploration and analysis of abnormal high-dimensional problems in digital image recognition, such as when high-dimensional data acquisition is carried out in low-resolution images, that is, high-dimensional data in low-resolution images of 250 M×250 M pixels are located in 62 500 M space. Due to a large amount of calculation, the large amount of data storage, large data

raster type, and image feature elements in the process of high-dimensional spatial data acquisition, it is difficult to recognize high-dimensional image spatial feature data and vector recognition coefficients, resulting in low image recognition accuracy, so nonlinear image recognition technology is used to reduce the dimensionality of high-dimensional feature values to realize image basic data segmentation, and then effectively improve the recognition accuracy and efficiency of images in the processing process [4]. Secondly, in the process of computer image recognition, due to the large amount of image element information generated by machine learning algorithms, if only the successive recognition process is carried out, it will not only cause accuracy problems such as image feature information extraction and recognition but also consume a lot of machine learning computer capabilities. The preprocessing process is adopted, firstly, the collected original picture data is grayed and simplified in black and white, and the image feature pixel index is enhanced by graying and black and white contrast algorithms, and secondly, the image pixel distribution law is extracted, and the preprocessing process is carried out for image feature vector extraction to improve the matching degree of feature vectors in the image recognition process, and then the division of normal image information and abnormal image information is improved through the machine learning system and multiple comparisons of cross-verification, and the intelligent level of image recognition is improved [5]

3.4. Computer identification system function modules enable analysis

In the process of computer image recognition and processing, the functional modules of the system (such as image transformation, boundary removal, feature vector screening, extraction, etc.) play a vital role, and the implementation process of the functional modules in this paper is as follows: (1) The functional module components are mainly feature vector screening, machine learning model training, image display area, prediction classification display area, prediction result generation, etc[6]. ; (2) Through each component functional unit, the original picture resources are obtained by opening the camera through the hardware device, and the original picture is reduced in dimensionality reduction and feature vector selection; (3) Import the selected computer image feature elements into the feature vector model based on principal component analysis, and carry out feature analysis and extraction of the identified images; (4) After the recognition analysis, the new picture is loaded into the pre-trained model for predictive analysis to generate the recognition result of the image; (5) Output the image feature prediction results of machine learning to a new text box, and perform the process of size adjustment, brightness adjustment, strip adjustment, texture adjustment and resolution adjustment.

3.5. Image recognition construction in machine learning mode to achieve analysis

Since the image recognition technology of machine learning algorithm mainly interprets sensory data through the digital pattern perception, calibration, classification, input and other processes of machine models in the extraction of image pixel feature vectors, and converts images, text and other data types into vectors in the current digital recognition mode, on the one hand, it improves the accuracy and

performance of data types in the process of digital interpretation of images, and on the other hand, it realizes the learning and recognition of complex feature vectors, and improves the error ratio of machine learning methods [7]. For example, in the process of image recognition construction, its complex feature learning and recognition is as follows: (1) image recognition vector learning to detect the edge; (2) Deep image texture feature recognition, etc., the detection is gradually deepened in the process of recognition implementation, and the learning recognition construction from edge recognition to deep maximum threshold recognition is formed [8].

In summary, the intelligent image recognition technology based on machine learning algorithm continuously optimizes the algorithm model systematically by constructing the feature vector model of related images and the multidisciplinary cross-assistance features of the machine learning algorithm, and at the same time, on the basis that the image data meets the storage conditions, the model training is carried out through the machine learning training set and the test set, and the image recognition feature element database is continuously enriched. For example, the current detection algorithm is mainly based on regional convolutional network, real-time fast target detection, object detection, etc., in the process of database extraction feature vector, the main body is divided into three parts: extraction layer, fusion layer and output layer, that is, in the extraction layer, the feature values of image pixels in different dimensions are collected, in the fusion layer, multi-scale feature maps are realized for target image detection, and finally the output of the extracted image feature indicators is realized through the output layer, so as to effectively realize the accuracy and efficiency of image pixel feature index information recognition.

4. Image Recognition System Application Analysis

The machine learning computer image recognition algorithm designed and constructed in this paper has high recognition accuracy, intelligence and comprehensiveness, and has two basic characteristics:

(1) For the detailed information of image recognition, the feature vector is effectively combined with the edge information recognition through edge information extraction, which improves the recognition accuracy, intelligence and comprehensiveness in the process of construction and realization.

(2) By recognizing the basic information of the image (color, edge information, image texture features, etc.) as the recognition target localization factor, high-precision recognition for a single image area is realized in the construction and application process [9].

Therefore, in practical applications, it is mostly suitable for

smart home fields, financial fields, traffic safety fields, security and intelligent medical fields. For example, in the process of smart home, high-definition cameras are used to obtain image content filling and recognition, and then realize early warning display, if suspicious persons are detected and identified in intelligent access control, information can be quickly fed back to the user management office, early warning voice prompts can be realized, and security applications can be realized through intelligent image recognition.

5. Conclusion

The computer network image system is constructed through the cross-verification of machine learning algorithms, the repeatability test recognition characteristics of the test set and the training set, which improves the intelligence, efficiency, safety, and accuracy of computer image recognition, and at the same time, the machine learning method realizes the recognition and analysis of multi-image feature vectors, colors, edge information, and texture features, making the role of this technology in multi-field applications extremely critical.

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