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Deep Learning Technology in Data Information System

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Abstract: *With the development of data processing technology, data processing and analysis have become a problem that must be faced today. The deep learning technology is composed of a feedforward neural network, and the model nodes form a layer of association relationships. This paper studies the processing efficiency, accuracy and error of the network model based on deep learning technology. The segmentation statistics of language data by different models are studied separately, and the delay and total processing time of a large number of file data processing in the information system are studied. As the number of deep learning model node nodes increases, the data processing time will be greatly reduced. When processing the same amount of data, small data files will consume more time. With the expansion of the cluster, task allocation and data transmission will consume part of the system resources and time, but as the scale of data increases, the system processing capabilities gradually appear, and the average processing delay gradually decreases.*

Keywords: *Deep Learning Technology, Information System Data Analysis, Neural Network Model, Machine Intelligence Learning, Segmentation Statistics, Language Data, System Processing Capabilities, Nurser Database*

1. Introduction

With the development of the Internet and computer technology, the amount of data is greatly enriched, and the computing power is greatly improved. Deep learning is no longer a theoretical technology. Early deep learning was limited to a variety of application data, and there was no high-performance computer support. Each training took several weeks or even months. This method was not practical and was not valued. With the expansion of data scale, the use of deep learning methods can obtain higher accuracy. Therefore, for problems that can be solved with traditional machine learning methods, as long as there is a large amount of data, they can basically be solved with deep learning methods. The performance improvement of deep learning technology is disruptive in the technical field. This disruption is not the end, but the beginning of a series of disruptions. The basic invention of the engine subsequently led to the invention of automobiles and airplanes in specific application fields, so the encounter of deep learning technology with public security big data, video surveillance and other application fields will also produce industry disruptive results.

Hou Y divided the steps of the computer learning algorithm into two modules, namely the shallow learning module and the deep learning module [1]. The learning algorithm set by manual parameters is a shallow neural network, and it was later pointed out that it can only analyze classification problems that are directly related. The back-propagation neural network model invented by professor Cheng Y solved the discrete classification problem, but later the PB neural network model was pointed out that it had the defect of class disappearance, which put the research on deep learning neuron algorithm in a state of suspension again [2]. Hochschild J solved the antagonism of the original PB deep learning model class, the information system data analysis model appeared again in the data processing industry [3]. Jung J proposed a method of calling deep learning at the first level, extending the fuzzy layer to six layers. The development and improvement of semiconductor hardware provide the necessary basic conditions for detecting multi-layer neural systems [4]. At this time, the use of neural system models for deep learning has a big direction. This multi-layered architecture realizes the transformation of ladder-level features through the model structure, and can convert imported data relationships into new correlation indicators. It can realize the simulation of complex functions with fewer parameters and depict rich internal relationships of data.

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Yetisen A K designed a big data information processing program based on RDL, which has become the most common model of deep reinforcement learning [5]. Jantz R. C and others have studied a new format-specific data analysis model on the basis of iterative neural networks. This method is simply applied to data classification suitable for large amounts of data, which can divide hundreds of millions of bytes of data. Google video is divided into hundreds of categories [6]. The model uses four spatiotemporal information fusion methods: single frame, 2 unconnected frames, multiple adjacent frames and multiple adjacent multiple frames to train the iterative neural network. In addition, a new multi-data node analysis model is proposed, which greatly improves the learning speed of deep learning applications. Nie J proposed a two-dimensional iterative model for behavior recognition. The model uses two-dimensional iterative extraction of time and space parameters, and can obtain the motion between many linked frames [7]. The model forms multiple feature map channels based on the input frame, and combines the information of all channels to obtain the final feature representation. This two-dimensional iterative model has both advantages and disadvantages: the advantage is that the two-dimensional iterative network model is superior to other methods when processing data in an actual environment. The disadvantage is that compared with TKH data, this model is at a disadvantage compared with other methods.

This paper studies the efficiency and accuracy of network model processing information system data based on deep learning technology. It studies the word segmentation statistics of language data by different models, and studies the delay and total processing time of a large number of file data processing in the information system. Based on the deep learning model, the learning efficiency of the model on 1.6G data with different file numbers is tested. Collect the required information, learn the UCI data set, and use statistical information to reflect, and then use the topological structure to analyze the data, and then get the learning effect of the model.

2. Data Analysis of Deep Learning Technology in Information System

2.1. Deep Learning Technology

The deep learning mode uses a multi-layer ribbon model, which can contain multiple layers of discrete transformations. Discover distributed data from the low-level high-level summary of the organization to the data framework, and show the optimization algorithm and ideal effect of processing and analyzing the ideal data set in a diversified representation form [8]. Today, technology has made major breakthroughs in the field of information system data analysis. In this case, the incidental data processing realizes a learning network technology called deep structure by using a deep neural network. DNN is a typical representative of many effective models, including iterative neural networks, recursive autoencoder neural networks, speech matching networks, and adversarial generation networks. These models have a high degree of learning [9]. Among them, CNN, RNNAR and DBN have made breakthrough progress on the basis of DNN.

Neural networks can have far-reaching advantages in the development of data input recognition, and the learning technology can have a far-reaching long-term position in the hidden layer, so as to retain the connection between information. In other data mining, behavioral learning algorithms are more flexible and accurate, which can make up for the failure of many data mining methods [10]. In education, deep learning steps play an important role in data mining and technical-level sensory learning. The feed forward neural convolutional neural has very deep experience. Convolution is based on two foundations, element extraction and element surface layer. Convolutional neural network has been widely used due to its unique network structure, and the complexity of the model used to reduce weight sharing is also greatly reduced. The cyclic nature is understood as the set of input neural connections is better than its own learning data, the recursion rate is high or the layer is approached through a neural network, and multiple layers are hidden and output. This operation completes the loop by adding the weight of the SVM to the beginning of the hidden layer [11]. The long-term and short-term memory network is a special RNN proposed to solve the problem of noise and slope gradient remaining in the traditional recurrent neural network. It retains long-term data in the new state, solves the problem of long-term dependence, and has been widely used in RNN models. Recurrent neural networks can periodically transmit data and understand and perform other operations, and perform better in semantic predictive analysis. The realization of multi-layer neural network also relies on computer hardware technology to a certain extent [12]. Researchers can build more layers of neural networks for higher-level computers to achieve more complex network models. For the activation layer, sigmod function and reluh function are generally used, and the form is shown in formula (1) and formula (2):

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$$sig(x) = \frac{1}{1+e^{-x}} \tag{1}$$

$$relu(x) = \min(x,0) \tag{2}$$

The ideal deep learning algorithm is a kind of extremely relevance learning, with directly related upper and lower layers constituting the basic unit of feature recognition. The input data first enters the basic interval to be extracted, and then the extracted features are used as the input of the upper basic module, and then a deeper data relationship learning is performed in the upper module. In the deep structure, the input data is obtained from the input port, and the relationship from small association to multiple association is established[13]. The current ideal deep learning algorithms include: deep belief network, iterative neural network, convolution neural network, etc. The basic algorithm that forms the conviction network is the learning of the boltzma model with node-by-node restriction between the relationships, and then the neural network node in the basic module is the layout of the largest similar imported information. The basic unit of the iterative neural network is the single-node iterative neural network, which is mainly divided into three stages: iteration, discrete transformation and deep sampling. By performing iterations, discrete transformations, and depth sampling in correlation with each other, different levels of correlation information can be obtained [14]. The cyclic neural network adds a loop to its deep layer neurons, stores the established relationship in the relationship network, and determines the possibility of the next relationship establishment and the storage location. Recurrent neural network can be regarded as a neural network that is delivered in time, and its depth is the length of time. DBN uses a pre-learning method, which is suitable for unlabeled learning models. For labeled learning models, DNN and MNIST models have more efficient simulation effects. At present, the DNN and MNIST algorithms are mainly used in occasions that contain a large amount of iconic data (such as images and speech). DNN's information system data recognition method has a very large correlation with the image recognition process of the human brain. Therefore, DNN is very conducive to image perception, such as learning related operations of the human body in browsing videos. DNN is also suitable for problems related to text learning and handwriting learning, such as study assignments or fuzzy fonts transmitted over the Internet. MNIST is generally used to process timing information, such as recording analysis. With the emergence of deep-level association technologies, DNN and MNIST are used more in combination. For example, in human language analysis, DNN can be used for perception classification, and MNIST can be used for language simulation based on global information.

2.2. Deep Learning Network Model

(1) Believe in Network Model

DBN is that geofrey learns the relationship between neurons, so that the neural network can generate learning data according to the maximum probability. Therefore, not only can BDN be used to identify elements and cluster data, but it can also be used to generate data. DBN consists of multiple controlled bolt machines [15]. The unrecognizable unit of the upper layer of the restricted bolt machine is used as the recognizable unit of the next layer of the restricted model machine. The general restricted bolt is a two-layer model composed of z recognizable units and k unrecognizable units. There is no connection between the neurons in the layer, and the neurons between the layers are completely connected, thus ensuring the existence of data relationships in this layer. The internal neuron requirements are local, which reduces the complexity of learning. If there is marked information in the relationship establishment set, the deepest recognizable level of the BRM includes both the unrecognizable unit of the upper level of the BRM and the marked level unit. For example, assuming that the top BRM has 200 neural nodes that can be identified and the learning data is divided into 20 groups, then the top BRM's identifiable module has 10 dominant neural nodes. For each learning data, the corresponding label neuron is turned on when it is set to 1, and when it is stopped, it is set to 0 to complete the data grouping.

(2) Iterative Neural Network Model

DNN is a multi-layer neural network, an artificial neural network, including an iterative layer, a pooling layer, and a fully connected layer. It is actually a reflection from import to export. By learning the reflection relationship between the import and export of a large amount of data, you can have the function of reflection between the import and export pairs [16]. Because DNN has achieved good results in various fields, it is the most widely studied and most widely used deep neural network in recent years. The most famous DNN models include Le-Net, Alex-Net, Google-Net, VGG, Res-Net,

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etc. Although these network models have certain differences in efficiency or learning accuracy, the basic algorithm units are the same. The correlation between data is manifested by their being accessed by the same application, so the distance coefficient between the data can be used as the basis for their cluster analysis. The distance coefficient is:

$$I_{kl} = \frac{\sum Min\{r_{ik}, r_{ij}\}}{\sum r_{ik}} \tag{3}$$

(3) Recurrent Neural Network model

The emergence of RNN is to adapt to applications where time sequence is very important. It is a neural network that transmits in time. The depth of this network is the length of time. Among them, the most commonly used recurrent neural networks are long-term and short-term memory networks, which realize the memory function in time by opening and closing doors [17]. The important feature of RNN is that it can handle variable-length input and obtain a certain output.

2.3. Re-Identification Data Analysis Technology on Deep Learning

The security of data re-identification technology is the foundation of long-term social stability. Nowadays, with the advanced development of technology, the concealment and advancement of criminal methods are getting higher and higher. The cameras all over the streets and alleys provide us with real-time monitoring of the social environment. Limited by manpower and material resources, how to conduct video analysis intelligently is a very important topic. In video surveillance, there are usually thousands of cameras, and the areas captured by these cameras usually do not overlap with each other. Therefore, how to detect the same data from two non-overlapping videos is a problem to be solved by data re-identification [18]. Data re-identification has broad application prospects in the criminal investigation work of the security industry and public security organs. Due to the differences in the placement of different cameras and deep learning scenarios, geometric distortion and color distortion will occur in the captured data images. Due to the efficiency of deep learning, the deep learning image will have a lower resolution, and different levels of data occlusion will occur at the same time. Usually, data re-identification faces problems such as lighting, viewing angle changes, posture, occlusion, making data re-identification very difficult. Data deep learning methods are mainly divided into two categories: one is the key sign comparison method, the goal is to extract the invariant features of different scenes for data matching, and the other is to improve the simple euclidean space distance measurement method. Functions that are not obvious can also achieve a higher matching rate [19]. For the problem of data re-identification, the general method is to combine the above two methods, use deep learning methods to extract the basic features of data images, and then use metric learning methods to distinguish different features as much as possible, thereby improving the accuracy of image matching. Deep learning methods have already shined in image classification and face detection. It can also play an important role in the problem of data re-identification. A mature data re-identification system can quickly capture and compare all received data without human operation. Monitor the data without manual cooperation. The system can provide a timely and effective reference path for public security organs to track fugitives, and assist security monitoring personnel in safety precautions.

2.4. Information System Data Analysis Technology

Analyzing data relationships and establishing information system data analysis models can use a variety of algorithms, depending on many factors, including data size, data type, application clustering degree, data relationship complexity, and data model to be established. Data-oriented relationships are established on the basis of models and data relationships appear in the data sets of various systems [20]. It extracts data from a system's data set for analysis, and then refreshes the associated information data set. Its advantage is that it can directly program the application front-end through operating data analysis algorithms without changing the application logic and data structure. However, system architects and developers must fully understand the complexity of database technology and the way information is exchanged between enterprises. In addition, it is very dangerous to change the database without knowing the integrity of the data [21]. In operation, a large number of changes to the original data access layer are required while maintaining data integrity. When data is exchanged via the Internet, because they need to understand the implementation of the databases on both sides, they need to bear high responsibilities. Usually, it is a very effective data exchange mode when the application is

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unwilling to change. But it also has some problems, for example, when a real-time data relationship is established, when one party's data set changes, an event trigger mechanism is needed to immediately notify the data exchange participants. It can be achieved by regularly monitoring the data collection, but if the time interval is too long, the achieved goal will not be achieved [22]. If it is too short, it will reduce the overall efficiency of the system due to multiple access to the data collection. When the data identification changes, the data node must modify its own data conversion parameters to complete the data relationship establishment. In the exchange process, because it is impossible to transmit all data (speed, performance and network resource limitations), only updated data can be transmitted [23]. In this way, the data transfer program must automatically detect data updates and keep the data synchronized. The biggest difficulty of data exchange for data exchange is how to integrate various databases in the enterprise, that is, it is an arduous task to achieve the goal immediately [24]. The general algorithm step is to first integrate the two databases together and make it successful, and then expand the scope of integration. To achieve data-oriented data exchange, companies must disclose their database access methods to exchange participants and data models, which will face many security threats and business conflicts of interest. Therefore, this data-oriented exchange method is mainly used for data exchange between systems within the enterprise [25].

3. Training Experiment of the Deep Learning Model of the Information System

3.1. Research Objects

The deep learning algorithm was tested on the UCI data set, and two data subsets were selected from the data system, namely nurser and census income. These two data sets have strong data system application conditions, and the data sizes and categories are shown in Table 1.

Table 1: Basic attributes of the data set

Data set name	Size	Number of attributes	Attribute type	Number of categories
Nurser	12960	8	Category	5
Census Income	48842	l4	Category/Integer	2

3.2. Detection Steps

In order to test the efficiency and accuracy of the model, the two data sets are divided into relationship establishment sets, re-matching sets and detection sets, and the scale ratio is 6:1:1. The relationship establishment set is used for the learning model, and the rematch set is used for the model, and the learning effect of the model is evaluated during the learning process. The detection set is used to test the performance of the learning model. During the setting of the experiment, the detection set cannot be intervened during the learning process. In this process, 2 deep learning algorithms and 1 multidimensional vector machine grouping need to be implemented. For the deep learning algorithm, the Mat-Net deep learning architecture based on DNN is used. Its basic components are programmed in assembly language, with a friendly interface and excellent computing efficiency. For the multidimensional vector machine grouper, SVM with great hardware conditions is used. Two research groups are designed to prove the efficiency of information system data analysis of deep learning algorithms. The first is to use an iterative neural network to match the feature tags of the two data sets. The specific method is to convert the two data sets into its built-in object MEDB through the API function of Mat-Net, and perform the maximum and minimum normalization of the data attributes. Then edit the data connection proxy for network matching, use 8 blocks to associate with each other, set the range of the iterative kernel within 1000 times, use Max-Pool for the buffer layer, and add the last 3 fully connected layers one after another. Set a 15% random shielding layer attached behind each fully connected layer. After 60 rounds of learning, the learning rates were 0.15, 0.011, and 0.05, and the toprerr of each round was recorded. The second method is to use a stacked auto encoder to encode the data set, and then use an 8-layer stacked auto-decoder to learn the multidimensional vector machine classifier. The final display size is 6, the nurser income is 8, and the multidimensional vector machine is Lib SVM is complete. The basic function uses a guided element function with default parameters, and does not set discard items. At the same time, the basic data relationships that are not passed through the automatic decoder will be directly imported into the multidimensional vector machine algorithm for comparison.

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Collect the required information, and use statistical information to reflect, and then use the deep learning model structure to learn the data, which is divided into linear structure and pie structure according to the actual situation. In the linear structure, the establishment of the data relationship occurs on the central node, which allows the node to receive data from each system module, analyze the received data, and then transform it according to the format of the data relationship to establish the target, and then send it to the target. Establishing the reference neuron data relationship through the data relationship can establish an information connection with a clear relationship between the data collection neuron and the target neuron. Analyze business indicators and basic data requirements in various data requirements, and simply list and classify them, and then perform data mapping on basic data requirements and source systems. While analyzing, deep study the feasibility and implementation plan of its technical implementation.

4. Training Experiment of Deep Learning Model of Information System

4.1. Accuracy Analysis of Deep Learning Model

Table 2: Classification accuracy and variance of convolutional neural network

Data set name	Correct rate	variance
Nurser	92%	1.3%
Census Income	88%	2.5%

The accuracy and variance of the model classification of the two data sets in this experiment are shown in Table 2. The learning accuracy of nurser is 92%, and the learning accuracy of census income is 88%. From the analysis of variance, the performance of the data set decoded by the stacked automatic decoder on SVM is better, and the deviation of variance is only 2.5%, which indicates that the deep learning algorithm has a great optimization effect in the data analysis of the information system.

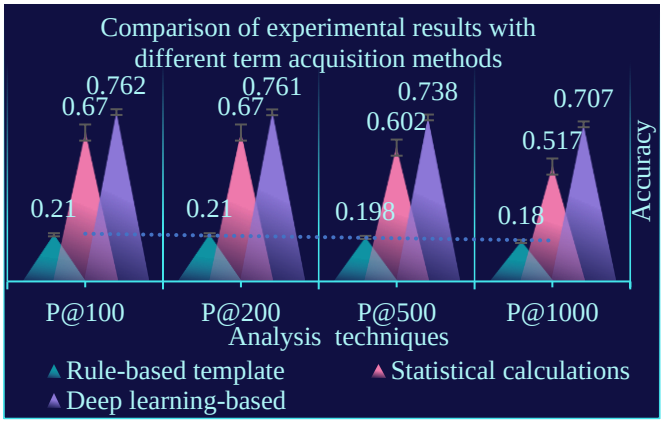

Figure 1: Comparison of experimental results with different term acquisition methods

As shown in Figure 1, the accuracy of the manual-oriented method is very low, so the manual-oriented method is rarely used alone for entry extraction. The C value method and deep learning model based on language method and decoding calculation have good information system data analysis effects. With the increase in the amount of data, the accuracy of the C value method based on language and decoding calculation has been greatly reduced. This is because the C value method based on language mode and decoding calculation sorts candidate words in ascending order of C value. A candidate word with a larger C value is more likely to be a real word. The ranking of the preselected words in the deep learning automatic decoder algorithm is the same as the ranking of the word vector learned by word2. Therefore, the keywords after the word segmentation of the information system data show a larger discrete type. With the increase in the amount of data, the floating range of its accuracy is smaller than the floating range of the C-Value method. Through research and analysis, the deep learning algorithm model can complete the support vector representation of the keyword vector space, thereby completing the deep learning of the relational database, and the deep algorithm using the automatic decoder can effectively reduce the dimensionality of the information vector space of the data set.

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4.2. Efficiency of Information System Data Analysis

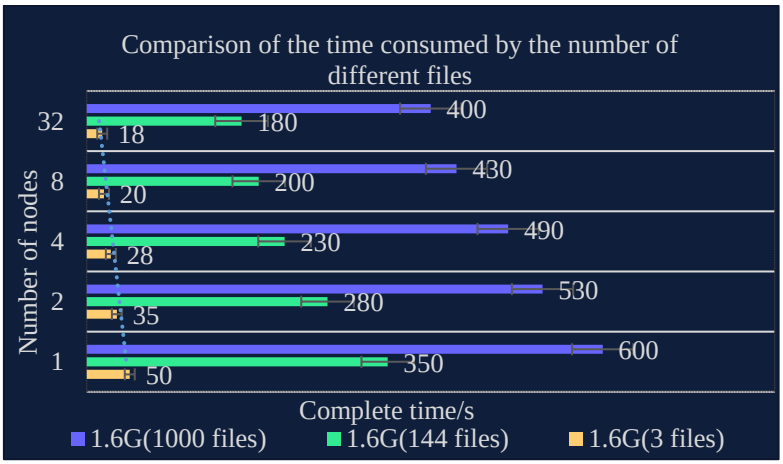

Figure 2: Comparison of the time consumed by the number of different files

As shown in Figure 2, as the number of deep learning model node nodes increases, the data processing time will decrease, and the initial time will decrease very rapidly. Compared with a single node, multiple nodes can reduce the execution complexity by nearly 10%. In the end it gradually became slow. The three data processing time trends are more similar, but to a certain extent, it can be concluded that the more data, the better the characteristics of information system data analysis in the deep learning model. For a data string of a specific size, in order to improve the performance of data processing in information system analysis and calculation, if it is only a small set of routing paths, more obvious performance advantages can be obtained by adding nodes, but as the number of nodes increases, adding the cost-effectiveness of nodes will become lower and lower. Currently, some methods specific to deep learning models can be used to improve performance, such as data compression. Although the three sets of data are all 1.6G information, it is obvious that small data files will consume more resources. There may be two situations. Depending on the type of deep learning model, the parameter value of the data block size of the deep learning model is 32MB, and any file below the parameter data block range is called a small file. The files used during the experiment are much smaller than 32MB, and will be scattered separately and stored on different data nodes. Since the deep learning model node stores the information of each file in its corresponding data node, and searches and obtains the required block information from the deep learning model node to another deep learning model node, if there are a large number of small files in the information system files will inevitably increase the burden, and the processing efficiency of the deep learning model node and the entire data will also be low. Affected by the deep learning model reduce, the mapping task usually executes one input data block at a time, and a large number of small files will also cause additional burden in the deep learning model reduce processing.

4.3. Frequency Analysis Variance of Deep Learning Scan Model

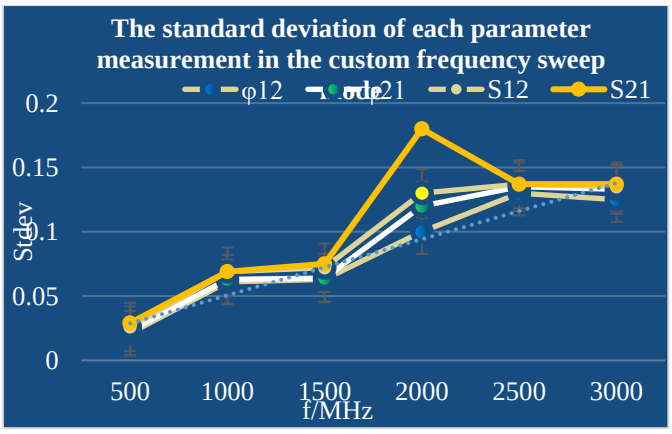

Figure 3: The standard deviation of each parameter measurement in the custom frequency sweep mode

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The data analysis scan frequency calculation result of the deep learning information system is shown in Figure 3. In the custom frequency mode, the detection and statistics of 100 averages and standard deviations (EVSTD) are completed. It can be seen from the figure that the maximum standard deviation of the transmission amplitude measurement is 0.02dB; the maximum standard deviation of the transmission phase measurement is 0.16°; the maximum standard deviation of the reflection coefficient measurement is 0.002. The average of these measurements will be compared with the interpolated information in the equally spaced frequency sweep mode, and the standard deviation will be used for data analysis.

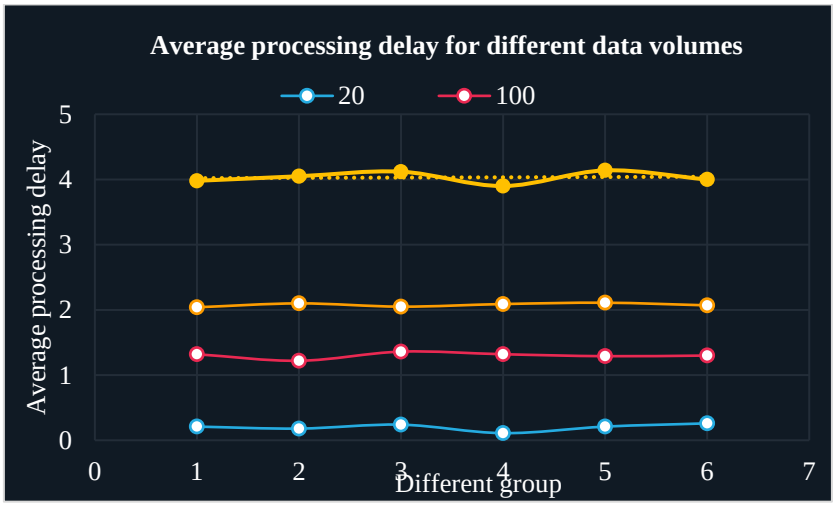

Figure 4: Average processing delay for different data volumes

As shown in Figure 4, by setting different amounts of data, the processing delay of this article was tested, 4 global workflows were set, and the number of cluster nodes and the output results of sliding window processing were observed respectively, and the tuples received and processed were counted. The smaller the amount of data, the time to process the data is shorter. For example, when the amount of data is 250GB, due to the expansion of the cluster, task allocation and data transmission will consume some system resources and time, and there will be some delays when the topology model processes the data. However, with the increase of the data scale, the processing capability of the system gradually emerged, and the average processing delay gradually decreased.

5. Conclusions

Information technology has made great progress in the past few years, especially information system data analysis algorithms that incorporate deep learning technology. Since a few years ago, the error rate of the new algorithm in the same test has dropped significantly, and efficient deep learning models are widely used in the industry, such as video processing, image analysis, and access control. Considering the information system data analysis model in the security field, special attention should be paid to the problem of connecting nodes, and in terms of strength and reliability, the deep learning information system data analysis program still has some shortcomings.

With the continuous popularization of Internet technology, data patterns will increase, and training time will become a bottleneck for Internet companies to release products. In the future, it is necessary to develop hardware and equipment to further improve the technology suitable for high efficiency, and a special football model is needed to improve the sports model. There is a lot of research on deep learning at present, and its application in various fields has also achieved a certain position, but there are still many problems that need to be further studied and resolved. For example, the key character deep learning does not have data with specific labels, and the dominant position is still the deep learning with characteristic label data. However, there are many data without specific labels that people cannot count. Adding labels to these unlabeled data is an issue, therefore, feature learning that does not specify the clustering technology of shape data is the key to the study of deep learning, and attention must be paid to research and development in this field. There is a great correlation between the scope of model application and learning speed and accuracy. How to obtain a balance is a very important issue. The larger the deep learning algorithm, the higher the corresponding learning accuracy, but the training speed will also be greatly reduced. Therefore, in the process of continuously improving the

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training accuracy, how to increase the training speed correspondingly is also an issue that still needs to be studied. It is usually not good to develop deep learning algorithms without combining them with other applications. In order to integrate other application skills and related models, deep learning algorithms will show higher efficiency in the application of information and data analysis.

In terms of careful system data analysis, deep learning technology dominates. The classification, detection and accurate image recognition of data analysis services in neural network disciplines mainly rely on deep learning models. Deep learning technology will surely become a part of large-scale network data, which can significantly reduce the cost of labor and data processing and analysis, and improve efficiency.

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