A Multi-Source Heterogeneous Data Fusion Method Based on Deep Learning

Xiaomei Yang[1,a,*], Wenqiang Guo[1], Zhonghua Zhao[2]

[1]College of Information Management, Xinjiang University of Finance and Economics, Urumqi, 830012, China

[2]College of Physics and Electronic Engineering, Xinjiang Normal University, Urumqi, 830054, China

[a]16792125@qq.com

*Corresponding Author

Keywords: Deep Learning, Multi-Source Heterogeneous Data, Data Fusion, Information Extraction

Abstract: in the Context of Big Data, Combined with Deep Learning, This Paper Discusses the Problem of Multi-Source Heterogeneous Image Data Fusion. Based on the Basic Framework of Data Fusion, a Depth Generalization Model of Multi-Source and Heterogeneous Image Data Fusion is Designed. the Deep Learning Technology is Applied to the Information Extraction and Mining of Multi-Source and Heterogeneous Data.

1. Introduction

In intelligent warfare, intelligence is very important. With the development of the device, especially the improvement of the performance of multi-source nonuniform sensor, a large number of multi-source nonuniform information data are generated[1]. These intelligent data can be used to identify the activity rules of the target according to the characteristics of the target in the battlefield environment. In order to master the combination of battlefield data, I can use my things. In addition, predict the tendency and intention of the correct battlefield situation of Figure 2. The high-level characteristics of battlefield environmental targets improve the accuracy of mining industry, making the prediction of target method possible. The advanced function can confirm, match and describe the battlefield target data, so as to realize accurate prediction and battlefield target activity trend and decision. Important military technologies competing for development in the world. The high-level function of the target can refer to the deep abstract features to describe the approximate characteristics of the target. These characteristics can generally summarize the characteristics and attributes of the target. In the method of target function, the selection of function manual is simple and simple[2]. However, in order to be widely used, the selection object functions in the manual are mostly shallow features, with low feature abstraction and limited semantic expression. Recently developed deep learning has the outstanding performance of extracting object depth features. Based on deep learning, the function of selecting target height has powerful function and good significance. The tendency and intention of the active target on the battlefield, the complex abstract control of the complex source data, the outstanding abstract and strong significance. In order to obtain high-level features of high-level targets, in-depth learning is carried out on the basis of high-level target extraction and selection. In technology related research, their goal is activity rules. The activity trend prediction they mine provides the most basic technology for real-time and accurate update. A blueprint for a credible battlefield situation for rapid and accurate discovery.

2. General Idea

In this paper, the methods of constructing multi-source heterogeneous data feature learning and deep fusion learning model are investigated[3]. In order to use the features learned by each layer of the model, a reasonable and effective feature fusion method is proposed to extract the complementary information contained in different feature layers and improve the scalability of the model. The combination of deep information fusion model and neural network for inference, deep

  DOI: 10.25236/iiicec.2019.023

learning, training and learning is based on the multi-source hybrid fusion mode of heterogeneous data input at the same time, fusion of multi-source sharing function for feature extraction of high level target features. Specifically, firstly, the multi value features of the target are extracted from the data source, and a simple and generalized deep learning framework is constructed. The feature transformation, feature selection and feature classification used in the framework are studied, and an effective deep feature model is constructed. In order to make better use of the features learned through the model, combined with the features of each layer, the feature transformation method and classifier method used in the model are studied, and the basic algorithm used in the model is studied. In-depth research, the advanced function of the selected object is extracted by combining the feature transformation and feature selection algorithm to implement the deep learning model. Second, the combination of deep feature learning mode and deep fusion learning mode of heterogeneous composite source data, and the deep learning construction mode of multi-source data intellectuality and general feature vector. The hybrid heterogeneous data fusion technology combines the general deep learning mode and unified method of learning model, which is suitable for all types of single model[4]. As the model of global deep learning model, we learn the basic components, learn the composite model of uneven input data and simultaneous training combination. It can be applied to the framework of heterogeneous fusion learning model of multi-source data. In order to realize the multi-source fusion deep-seated source learning model, a specific deep-seated model is installed according to the feature learning and composite feature extraction method. As the whole guide of the research, first of all, we should build the hierarchical structure under the framework of deep learning model. The framework consists of two parts: multi-level feature learning unit and final classification unit. In order to build the model, the starting point is to be able to generalize simple deep learning, so the methods used in feature extraction, feature selection and feature learning classification strategy should have good generalization ability.

3. Deep Learning Model

A typical deep learning model is a multi-level iterative model based on “feature transformation nonlinear operation feature selection (subtraction)”[5]. The feature information can be extracted in this stage by designing the feature transformation of filter and other feature extraction methods. At the same time, the non-linear operation can double the characteristics of the transformation, or use the logistic regression function. For classification and other machines, use the function selection of both active and prohibited states. In addition, select the characteristics of learning topics. At the same time, the size is smaller. As a result, the scale of the deep network model remains within a certain range. By combining the low-level features of deep learning concept researched by artificial neural network, a more abstract high-level representation attribute category or function is formed to discover the distributed feature representation of data. Deep learning uses a layered structure similar to neural networks. The system is composed of input layer, hidden layer (multilayer) and output layer. Only nodes of adjacent layers are connected. It doesn't matter.

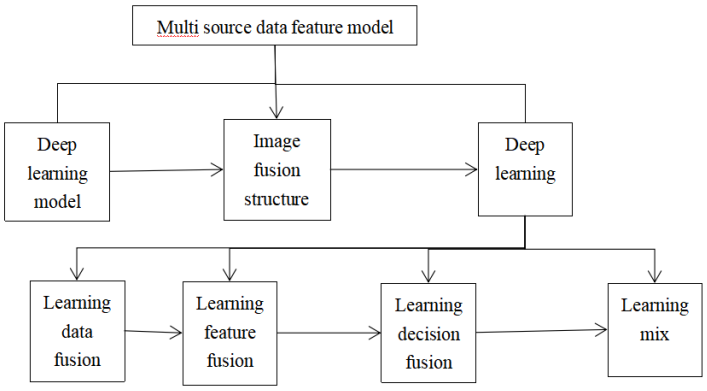

Fig.1 Block Diagram of Overall Idea Structure

3.1 Model Building

After making the training plan, it is necessary to build the neural network model. The neural network consists of many simple neurons, the output of one neuron is the input of the other. Figure 2 is a simple depth neural network. Circles represent network input. A circle marked "+ 1" indicates the offset unit corresponding to the intercept period. The first layer is the input layer of the network, and the bottom layer is the output layer of the network. The middle class is the hidden layer. Because the value of the node is not seen in the training set[6]. The input layer of the artificial neural network in the figure has three units (except for the bias device), and the units have two hidden layers. The first layer has three hidden elements, the second hidden layer has two hidden elements, and the neural circuit of two output elements provides a method to define complex nonlinear hypotheses. Adjust W and B in line with the set goals. This is an optimization process called training process. In order to train the network, we need a set of samples[7]. Of course, the actual network model is larger than the above network model. The designed neural network model is initially set to 16 layers (convolution + convergence + complete connection). Neurons use linear functions in relu. Use slow ball end to reduce overflow. Convolution and convergence are the basic operations of deep neural network. The concept of analysis is the concept of human visual receiving field, that is, taking the focus as the center, derived from the small field. The nature of the overlay increases along the two-dimensional space of the image. You can learn more effective features. Sharing convolution kernel can reduce the number of parameters and the complexity of the model. Convergence can be used for down sampling and learning of spatial features of images. These functions have specific deformations such as transformations and rotations. For example, scale invariance, etc., the first term of the cost function J (W, b) is the average value of the sum of the square differences. The second is to reduce the weight size and prevent overlapping adjustment items.

3.2 Model Parameter Optimization

It is important that the designed network model is most suitable for all nodes in the network. This requires training samples and training. Each training is an iterative correction of network parameters. Then, the configured network can recognize and learn the interested objects again until the training samples are in various states. Cognitive learning forms a representative description of objects. By optimizing the network model, the target learning is more in-depth, the characteristics are more clear, and the accuracy of the detection model is improved. Therefore, the optimization of model parameters is very important.

4. Model Structure of Multi-Source Heterogeneous Data Fusion

There are many ways to select advanced features of objects and extract data sources. For multiple data sources, there is a problem of feature extraction under the unified framework of basic processing of information fusion technology. Based on the basic principle of information fusion, the data fusion model is based on the level of data abstraction in common data, and the data extraction level is based on the fusion of feature layer. A hybrid fusion of the flexibility of machine learning model and the complexity of heterogeneous data fusion is proposed. This paper analyzes the information fusion architecture from three aspects of image data fusion: light, SAR and infrared. Pixel fusion can be carried out under the condition of affecting data[8]. In the multi-source heterogeneous image, the comparison of the differential image data of the heterogeneous camera mechanism has various image transformations, and the fusion of pixel level (horizontal) data is very difficult. Three models of pixel fusion feature fusion, decision fusion and hybrid fusion are explained. Feature fusion can be divided into target state information fusion and target feature information fusion. Target state fusion is mainly used for target state tracking. In the fusion process, parameter correlation and state vector estimation are used. Multi-source information mainly includes all kinds of intelligent radar, tracking infrared and other non image information sources. The fusion of target features is a common understanding at the feature level. The specific fusion

method is closely related to pattern recognition technology, but the feature of fusion pattern recognition is joint feature. The multi-source heterogeneous information involved includes various intelligent radars and other non imaging information. The information source and image source of SAR, infrared image and visible image are described. The feature fusion here is the fusion of target characteristics, optical characteristics, infrared and SAR images. Figure 3 shows the fusion structure. Feature fusion can not only improve the probability and accuracy of feature extraction from a single sensor image, but also get some useful composite features.

5. Data Level Fusion Based on Deep Learning

Data level fusion is also called pixel fusion in image data. Under the same space-time condition, for the uneven image of multiple sensors of the same target, the uneven fusion image can be obtained by pixel fusion[9]. Large scale heterogeneous image can fuse multiple heterogeneous fusion images. Data level fusion based on deep learning uses these unequal fusion images as training samples. The final classification and recognition results can be obtained by using the neural network model which can identify the target in the image of uneven fusion for detailed neural network training.

6. Conclusion

Deep learning has made a breakthrough in image and sound research. However, the deepest learning model is only used for learning, which uses atypical two-dimensional spatial meaning information instead of typical vector features. In addition, the deep learning fusion model of multi-source heterogeneous data is blank. In this paper, a common deep learning framework for multi-source image data is used. learning model

References

[1] Lili, Zhang., Yuxiang, Xie., Luan, Xidao. (2018). Multi-source heterogeneous data fusion // 2018 International Conference on Artificial Intelligence and Big Data.

[2] Michael, Schmitt., Lloyd, Hughes., Xiao, Xiang, Zhu. (2018). The SEN1-2 dataset for deep learning in SAR-optical data fusion // ISPRS TCI Symposium.

[3] Chen, G., Yong, C., Cong, W. (2017). Multi-Source Heterogeneous Data Recognition Based on Linguistic Labels.

[4] Wu, XianHua., Xiao, Yang., Li, LianShui. (2017). Review and prospect of the emergency management of urban rainstorm waterlogging based on big data fusion. Chinese Science Bulletin.

[5] Pan, T., Chen, J., Yongliang, W.U, et al. (2018). The applied research of integration method for multi-source and heterogeneous spatial geological data.

[6] Fengjiao, Wang., Yongzhi, Qu., Lei, Zheng. (2017). Deep and Broad Learning on Content-Aware POI Recommendation // 2017 IEEE 3rd International Conference on Collaboration and Internet Computing.

[7] Zahra, Zohrevand., Uwe, Glässer., Mohammad, A. Tayebi. (2017). Deep Learning Based Forecasting of Critical Infrastructure Data// the 2017 ACM. ACM.

[8] Chongyu, Zhou., Yao, Jia., Mehul, Motani. (2017). Learning Deep Representations from Heterogeneous Patient Data for Predictive Diagnosis // the 8th ACM International Conference. ACM.

[9] Yanfang, Ye., Lingwei, Chen., Shifu, Hou. (2018). DeepAM: a heterogeneous deep learning framework for intelligent malware detection. Knowledge & Information Systems, vol. 54, no. 2, pp. 265-285.