Generation System of Dispatching Order Sheet for Distribution Network with Self Checking Function Based on Generative Countermeasure Network

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Abstract. Although the recent wave of artificial intelligence research led by deep learning has achieved very good results in the field of supervised learning. Unsupervised learning, as a method that can truly allow computers to learn from unlabeled real data from the real world, can avoid tedious and unavoidable data labeling work in supervised learning. If you want a computer to better understand the complex real world, the best way is to let the computer generate a representation of the real world in a certain way. The first thing needed to accomplish the above goals is the generative model. The most outstanding performance in generative models in recent years is the variational autoencoder and generative confrontation network introduced in this article. As an extension of the autoencoder, the former is a good combination of deep learning ideas and statistical learning. The high-dimensional distribution of the image can be reduced through the encoder network, and then the decoder network can be used to achieve low-dimensional Data distribution automatically generates an image similar to the original image. Therefore, in the subsequent improvement, the researchers took the advantages of combining the variational autoencoder and the generative confrontation network. The experimental results show that this paper has jointly trained VAE and GAN and achieved good results. However, due to the inherent shortcomings of the original generative adversarial network, the combination of the two still cannot achieve very good results.

Keywords: Generative Countermeasure, Self Calibration of Network, Distribution Network, Dispatching Instruction
1. Introduction

Natural language is the most common way of human communication. Generating natural language text that human can understand is an indispensable part of interactive artificial intelligence system. Many applications rely on text generation, such as machine translation, video or text summarization, question answering, and so on. For text generation tasks in machine learning environment, the aim is to predict the word sequence in a specific context with correct grammar and semantics. For example, it may be that given a picture, the model will generate a description that conforms to the content of the picture; or given an English sentence, the model will translate the sentence into Chinese; it may also give a question, and the model will give an appropriate answer to the question; or even, the model will imitate a specific language style to create poetry or literature.

For text generation tasks, popular methods include feedforward neural networks and recurrent neural networks (RNN). However, basic recurrent neural networks often have the dilemma of over-dependence on the distribution of training data. In order to solve this problem, researchers have proposed many new methods on this basis. For example, Ranzato et al. tried to introduce reinforcement learning methods into the training process of recurrent neural networks. Kiros et al. proposed a skip-through model, which reconstructs the relevant sentences of the input sentence through an encoding-decoding method, in which both the encoder and the decoder use recurrent neural networks. These methods have been successful in a variety of language model tasks, such as sentence translation and vocabulary prediction. However, models based on automatic coding often fail in the task of generating sentences from arbitrary implicit expression spaces. The fundamental reason is that when sentences are mapped from implicit expressions through self-encoding, the expression content of these sentences often only occupies a part of the implicit space. Therefore, most expressions in the implicit space do not really map to meaningful sentences, and random generation of implicit expressions from the previous distribution usually leads to unreasonable sentences. Bowman et al. used a variant self-encoding method to improve this problem. However, in principle, the hidden variables generated later cannot cover all the hidden space, which introduces new difficulties in the problem of randomly generating sentences.

Another challenge of using RNN to generate real text in this paper is related to the nature of RNN. Assuming that reliable sentences are generated from certain potential codes, the error rate will increase as the sentence length increases. The reliability of the first word in a sentence is often very high, but the meaning of the whole sentence is very bad. At the same time, in the process of randomly generating sentences, the length of the generated sentences is difficult to control.

2. Research on Distribution Network Dispatch Instruction Ticket Generation System with Self-checking Function Based on Generative Countermeasure Network

2.1. Distribution Method with Self Check Function Based on Generative Countermeasure Network

A tensorflow diagram describes the process of a group of calculations. Firstly, a graph is used to represent a computing task. Secondly, it is started in a session. The session sends the operation of the graph to the hardware devices such as GPU or CPU. At the same time, it provides the methods to execute the operation. After these methods are executed,
\[ CT = \sum_{i=1}^{a} 2 + \sum_{i=2}^{3} 4 + 6 - 42 \]  \hspace{2cm} (1)

The generated tensors are returned. In Python, the tensor is numpy Object [1-2]. Tensorflow, as a framework system of machine learning, focuses on solving the problems in machine learning Several core issues:

\[ RS = 7^3 + \sum_{i=2}^{3} 3 - 6 \]  \hspace{2cm} (2)

First of all, tensorflow can use very simple algorithms to realize various complex computing functions (including algorithm model), and release the research focus from code debugging to research itself. Compared with the traditional matlab simulation, tensorflow's workload is reduced by twice or even more, which greatly saves the development cost and time [3-4].

\[ CQ = \sqrt{7^2 + \sum_{i=2}^{3} 3 + 3} \]  \hspace{2cm} (3)

Secondly, tensorflow adopts hierarchical architecture design mode, which makes the model run on heterogeneous devices conveniently. At the same time, tensorflow back-end execution engine is separated from front-end programming language, and back-end execution engine is separated from hardware computing equipment, which realizes the design idea of "high cohesion and low coupling".

\[ BS = \sum_{i=2}^{3} 2 + \sum_{i=2}^{3} 3 - 4 \]  \hspace{2cm} (4)

Thirdly, tensorflow's kernel execution system is written in C++ language with high execution efficiency.

Finally, tensorflow contains tensorboard visual learning tool, which is convenient for program understanding, optimization and debugging [5-6].

\[ PS = \sum_{i=6}^{3} 2 - \sum_{i=2}^{3} 7 - 6 \]  \hspace{2cm} (5)

2.2. Distribution Design with Self Check Function Based on Generative Countermeasure Network

In order to improve the generative countermeasure network, there are several ideas as follows: firstly, the random noise distribution This is the main idea of conditional generative countermeasure network. Secondly, we can use other networks or methods to learn from the real data to get an input Z, and then input Z into the generator, which is equivalent to encoding the real data once. In addition, semi supervised learning mechanism can also be used, that is, adding a small number of class labels and introducing the relevant category loss measurement in the training of generative confrontation network. In this way, the idea of unsupervised learning can improve the stability of the training of generative confrontation network. The training convergence speed can be improved by improving the network structure [7-8]. The importance of similarity measurement is self-evident for generative
countermeasure network. Therefore, by improving the similarity measurement method, the training stability and learning efficiency of Gan can be further improved.

\[ RF = \frac{4}{3} + \sum_{a} 3 - \frac{a}{3} \]  

(6)

In this paper, cgan is introduced to replace the former Gan and VAE for joint training. Firstly, using the idea of conditional generative countermeasure network, the structure of dgan is adopted in the model, and the convolutional neural network is used to replace the multi-layer perceptron in the original Gan to build the model. In addition, according to the idea of wgan, the network model is further modified to get a new model, which is named VAE / cgan:

\[ OP = \sum_{6} 4 + \int_{7}^{3} \frac{3 - 4}{7} \]  

(7)

In the new model, SIGMOD will not be used in the last layer of discriminator. At the same time, the rmsprop optimization algorithm is used instead of momentum based optimization algorithm. Among them, the VAE / cgan model algorithm training process adds the generation step of condition y, using this model training process to complete the experiment of face image generation [9-10].

2.3. Method with Self Check Function Based on Generative Countermeasure Network

In the original Gans model, the generator can generate the generated data consistent with the real data distribution from a disordered random noise through the confrontation training between the generator and the discriminator. Obviously, in such a process, the input data Z of the generator is a continuous random noise signal and lacks sufficient constraints. It also makes Gans unable to use the input data of generator in the training process. Many studies have paid attention to this point, and have made breakthrough progress in the process of image generation [23]. This paper draws on this idea and combines it with the process of sequence generation confrontation.

Different from the image generation process, it is difficult to describe the hidden variables of noise data according to prior knowledge for text data. However, we can still assume that the noise data Z consists of two parts: one is random noise signal; the other is explanatory hidden variable, which is called label in this paper. Different from the simple use of noise data, we divide the input data of labellgans generator into two parts. One part corresponds to the continuous label, which is generated by Gaussian distribution; the other part corresponds to discrete label and uses one hot coding, which is the label of the noise data.

3. Experimental Research on the Distribution Network Dispatching Instruction Ticket Generation System with Self-Checking Function Based on the Generative Countermeasure Network

The biggest advantage of generative countermeasure network is that it can obtain the target feature representation without specific loss function in the training process. The disadvantage is that the training of Gan is not stable and often produces many meaningless outputs. However, degan model solves the problem by fusing Gan and CNN models, setting network constraints according to a large number of experimental results and human experience the generator model of Gan is modified from
the following three points.

In this article, we train a deep convolutional generative adversarial network on a dataset, imitating online learning. In the 50th iteration, the image generation effect is poor. The 100th iteration has initially shown human face contours, and the 500th iteration generates complete and realistic images. As the number of iterations continues to increase, the image generation effect begins to gradually decrease. The experimental results show that as the number of training increases, the training effect of DCGAN fluctuates and is unstable, and it is impossible to intuitively predict the best state of network training.

4. Experimental Research and Analysis of a Distribution Network Dispatching Instruction Ticket Generation System with Self-Checking Function Based on a Generative Countermeasure Network

4.1. Experimental Analysis of Power Distribution with Self Check Function Based on Generative Countermeasure Network

The experimental results of wgan-gp and jdmm Gan methods are shown in Table 1. The left side of Table 1 is the category information, and the right side is two groups of graphs. Table 1 shows the experimental results of wgan-gp and table 1 is the experimental results of jdmm Gan. Each row of the two groups of graphs represents an image of a category. Compared with visual effects, jdmm Gan and wgan-gp both generate persuasive samples, which share the same characteristics in the same category, and can be significantly different from other categories, which is also the embodiment of diversity. However, from the detailed method, it can be seen that the generated in Table 1 is more clear, and the background images behind the category are more abundant. In the left picture, it is easy to see the single background image and the example of solid color background. This also shows that jdmm Gan algorithm can learn more complex distribution.

| Table 1. Inception Score |
|--------------------------|
| Unsupervised approach | Semi supervised method |
| method | Inception Score |
| ALI | 5.34 ± .05 |
| BEGAN | 5.62 |
Table 1 shows the results of comparing algorithms from the perspective of human vision. Table 1 compares the performance of unsupervised and semi supervised Gan from the evaluation index of GaN. As an important index to measure the quality and diversity of generated images, the concept score is used to evaluate the model performance in Gan, and has become one of the most important indicators in Gan evaluation standards.

| Algorithm   | Score ± Error |
|-------------|---------------|
| DCGAN       | 6.16 ± 0.07   |
| Improved GAN| 6.86 ± 0.06   |
| EGAN        | 7.07 ± 0.10   |
| DFM         | 7.72 ± 0.13   |

4.2. Experimental Analysis with Self Check Function Based on Generative Countermeasure Network

Noise data dimension (inputdim) and label data dimension (labeldim). In the output phase, the required parameters include: sequence length of generated data. Finally, the training times of the whole network are also needed. The parameter setting is shown in Figure 1.

![Figure 1. Name and value of experimental parameters](image)

Among them, the threshold of training times is 20000. In the parameter selection experiment stage, in order to save the experiment time, this value is 5000 times. The number of self cycles of the discriminant network is 10 times of English input data and 5 times of Chinese input data, and the number of self cycles of the generated network is 1, which means that the training times of the discrimination network are far greater than that of the generated network in each iterative training. In addition, beta value is used as tagging noise parameter, and different values are selected to help select appropriate parameters. The dimension of noise data is 128 dimensions, of which 8 dimensions are tag length and 120 dimensions are noise data lengths based on Gaussian distribution. For the deep convolution neural network, the hidden layer dimension is 512 dimensions, the number of hidden layers is 10, and the filter size is 5, which meets the structural requirements of deep CNN.

5. Conclusion

The main research content of this paper is the method of generating countermeasure network based on
MMD. It is very important to measure the distribution difference between the two groups in GaN. The original Gan uses divergence to measure the distribution difference. In this way, there are some problems, such as the disappearance of gradient and the collapse of mode, which makes the training of Gan more difficult. The main content of this paper is based on MMD, a traditional measurement method of machine learning. The MMD method is applied to the feature space, which expands the application scope of MMD. On this basis, two new MMD based generative adversary network algorithms are proposed. As a unified framework, our algorithm can be applied to both unsupervised and semi supervised tasks, thus extending the generality of the algorithm.

References

[1] Wang J L , Jackson L A , Wang H Z , et al. Predicting Social Networking Site (SNS) use: Personality, attitudes, motivation and Internet self-efficacy[J]. Personality & Individual Differences, 2015, 80:119-124.

[2] Andra F. Negoescu, Elena Nikiphorou, Isabel Castrejon,. AB0945Clues to Recognize Fibromyalgia From a Patient Self-Report Multidimensional Health Assessment Questionnaire (MDHAQ) and Physician Rheumatic Checklist[J]. Annals of the Rheumatic Diseases, 2015, 74(Suppl 2):1215.2-1215.

[3] Imbert C , Mellet A . Self-similar solutions for a fractional thin film equation governing hydraulic fractures[J]. Communications in Mathematical Physics, 2015, 340(3):1187-1229.

[4] Gómez-Valent, Adrià, Karimkhani E , Solà, Joan. Background history and cosmic perturbations for a general system of self-conserved dynamical dark energy and matter[J]. Journal of Cosmology & Astroparticle Physics, 2015, 2015(12):048-048.

[5] Lee B H , Kim Y M , Jeong G C . Mediating effects of the ICF domain of function and the gross motor function measure on the ICF domains of activity, and participation in children with cerebral palsy[J]. Journal of Physical Therapy ence, 2015, 27(10):3059-3062.

[6] Fredland N , Mcfarlane J , Symes L , et al. Modeling the intergenerational impact of partner abuse on maternal and child function at 24months post outreach: Implications for practice and policy[J]. Nursing outlook, 2016, 64(2):156-169.

[7] Nikiphorou E , Negoescu A F , Castrejon I , et al. AB0945 Clues to Recognize Fibromyalgia From a Patient Self-Report Multidimensional Health Assessment Questionnaire (MDHAQ) and Physician Rheumatic Checklist:[J]. Annals of the Rheumatic Diseases, 2015, 74(Suppl 2):1215.2-1215.

[8] Blois S L , Lang S T , Wood R D , et al. Biologic variability and correlation of platelet function testing in healthy dogs[J]. Veterinary Clinical Pathology, 2015, 44(4):503-510.

[9] Park J H , Park J H . The effects of game-based virtual reality movement therapy plus mental practice on upper extremity function in chronic stroke patients with hemiparesis: a randomized controlled trial[J]. Journal of Physical Therapy ence, 2016, 28(3):811-815.

[10] Porhomayon J , El-Solh A A , Adlparvar G , et al. Impact of Sedation on Cognitive Function in
Mechanically Ventilated Patients[J]. Lung, 2015, 194(1):43-52.