Research and Application of Neural Network Based on Rough Set Theory

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Abstract: In order to analyze the performance of the neural network its black box characteristics, it is necessary to combine the neural network and the rough set theory, and use the rough set theory to initialize the parameters of the neural network, then determine, select and guide, finally put forward the application theory based on the neural network architecture of rough set. This theory is given various physical parameters. If the system outputs, after training the rough neural network, it can meet its requirements and performance, and there is a minimized error, which indicates that the experimental result is that the data mining task of the rough neural network can be completed by a better method. The accuracy values are verified and high in classification.

1. Introduction
Neural networks are a widely used technique for data analysis and mining. In application, if the black box characteristics of the neural network are reduced, it will be greatly affected by it, affecting people to extract a rule, and become a hindrance to study the problem. Therefore, the black box characteristics of neural networks are studied as topics of concern. Some scholars have achieved a lot of results in the combination of neural network and rough set theory. For example, some scholars believe that through the input of neural network, the rough set theory is used to simplify the topology of the neural network, and then related elements are proposed. It is the best that the rough set theory can be used for data preprocessing to some extent as a kind of compensation to extracting from the relevant network. It can find a way to hinder the smooth implementation of semantic rules. Combine neural network with roughness, propose data mining for rough set neural network structure and use neural network construction to adopt rough set. The theory finally forms certain parameters and constructs a framework of guidance and selection, which can improve the performance of rough and neural network structures, and lay a solid foundation for the application of neural networks in the future.

2. Overview of Neural Network Structure
In order to lay the foundation for extracting semantic rules in neural networks, the multi-layer structure of neural network structures based on rough and basic should be analyzed.

We can analyze it by definition. In the related theory, the basic concept of rough set theory belongs to the category of information systems. The analects are non-empty finite objects, which are attributes, and A is attribute sets. Yet another definition is to refer to the intersection of all equivalence relationships as an unclear relationship. The third definition is to set the information system in the upper and lower approximations, which are set to B and X respectively. The fourth definition is in an information system. Given B and X, the positive area is set to the POS inverse area set to Nej. The fifth definition is to set the boundary region within the function definition of the rough membership,
set to pr, which is an unclear relationship.

Rough set methods can process various data in a short time after creation, and can handle data inaccuracies and ambiguities, including incomplete data. The simplicity of practicality is surprising, with data on many variables, including deterministic and non-deterministic conditions, revealing intelligent control center rules and automated production of various granularity levels, including non-deterministic knowledge, such as the minimum re-representation of different particles of knowledge, especially suitable for the automatic generation of rules in intelligent control, can reveal the concept from the data is simple, produce accurate patterns, easy to operate patterns, based on rough and foundation The neural network calculates rules that are easy to check and verify.

In order to reduce the black box special effects of neural networks, scholars have established a field of neuro-fuzzy computing after extensive research with traditional fuzzy and contrast, and carried out analysis of objective and accurate characteristics of rough sets.

Many scholars have introduced fuzzy sets into the study of neural networks. Through the rough membership functions, different theories give the upper and lower subordination of a subset of the Analects because of the difference in the unclear relationship. The value of the approximation level is not given because of the unclear relationship, so the sample points are not given, and the exact probability of which interval belongs to is not accurately described. In order to solve this problem, a feasible method is adopted, which is to correct the partial flat relationship by synthesizing the rough membership function of the relevant information, and obtain the corresponding value. By constantly correcting the network parameters to analyze the numerical values, it is concluded that the working principle of the neural network is to approximate the true value, and the related concepts of the rough set are used to correct the value of the rough membership function, and finally the neural network is constructed [1].

3. Working Principle and Structural Analysis of Rough Neural Network
The system parameters of the rough set neural network are selected into four levels: the rough neural network is divided into the input layer hidden layer and the output layer. For example, the input layer is a method of data input of the construction system, and the multi-dimensional data is input, and the data with a large number of nodes in the layer is obtained, which can be divided into K1 intervals, and each interval is binary coded, and each dimension is input after the digital , you can enter the code as this node. The second layer of hidden layer is the genus phase located in the approximate space and all the data are built on the attribute set for classification of rough set theory. When necessary, the relevant values are input into the network, and then the data is classified into categories. , the node in the relevant attribute input layer and the node in the hidden layer are connected, and there is a knot connection. This connection fully reflects the partition represented by the nodes used in the attribute collection. Weights, the number of data nodes in the Analects can also be assigned corresponding weights. The hidden layer 2 classifies the relevant boundary regions and political regions in the Analects. According to the rough set theory, the division of the personality belonging to each subset is distinguished. Individuals in the boundary area may belong to the subset. Therefore, a method of union should be adopted between the boundary area and the area, and all the categories belonging to the individual are divided into the number of nodes. The number of the self reflects the degree of association between the attribute set and the argument and the subset. The number of nodes is set in the hidden layer, and the relevant full-time connections and calculations are performed, and the number of subsets of the class domain is obtained. At the node of the output layer, the calculation of the correlation weights in the positive region is included, which reflects the influence of the region represented by the classification result in the hidden layer 2 on the subset, and the numerical description method can determine whether a certain sample can be I have played a certain role in division [2].

The fourth layer is the output layer. The output layer is composed of a number of nodes, including node output values in the output layer of the subset number. The probability that these samples belong to the corresponding category, the size of these samples can be classified by comparing their sizes.
Use equivalence relations to classify, obtain decision rules by reasoning, and so on. Under the premise of keeping the dependency between the condition attribute and the decision attribute of the decision table unchanged, Pawlak Z. proposed a new mathematical tool for dealing with the uncertainty problem in 1982. This tool can simplify the decision table in many methods of data mining, complete the decision table with default values and better reveal the dependencies between data. Its main research content has certain objectivity. Based on the data processing of the decision table, the data is modeled and analyzed from different levels of abstraction. For the processing of complex systems, the information provided by the data itself is utilized to take advantage of: ① No need to analyze any data set before Knowledge is generated, and the resulting rules are simple, accurate, and easy to verify. ②Simplify the expression space of input information, discover the law between data, and express the knowledge of uncertain or inaccurate knowledge. ③Algorithm is simple and easy to operate [3]. Inaccurate, incomplete, and inconsistent data are based on set theory.

- Approximate pattern classification under the premise of retaining information, and data reduction;
- Gain knowledge from experience and learn new methods from experience;
- Inference based on uncertainty, analysis of inconsistent information, and inference of incomplete knowledge;
- Identify and assess dependencies between data;

4. BP Learning Algorithm Based on Probability
BP learning algorithm is an important learning method in the calculation of rough set neural network structure. This training method can train the sample and experiment with the training results before use. The number of subsets in the BP learning algorithm. In the hidden layer 2, the node is 2Q. In the input layer, N is displayed as Wij in the output layer, and the connection rights between the layers of the network can be compared first. The department initializes the network. For the random setting of the straight line, then the calculation of the corresponding attribute set in the hidden layer E and the node is performed, and the hidden layer is set in the earning and boundary area, and the node should correspond to the domain in the subset. The collection of individuals in the analects can form part of the explicit relationship with the nodes in the hidden layer, some of which are larger values and some of which are smaller values. The second step is to perform the forward calculation of the network, which can be calculated according to the formula, and the values between the layers are expressed to form a probability conversion function, and the individuals of the nodes belong to a certain type of probability for relative output, and then conversion, get the corresponding value positive correlation. In the third step, the connection weight is inversely modified, and the true setting of the category can be set for a certain sample. Because the output error of the current system can minimize the value, the corresponding derivative is obtained. The connection weight between the nodes of this layer can be modified, and the learning rate obtained after the modification can reflect the learning process.

5. Case Analysis
In order to verify the accuracy and effectiveness of the neural network structure in data mining proposed in this paper, standard values are used. When analyzing the performance of standard values, a variety of indicators are used for comparison to obtain certain accurate calculation results. First, the accuracy can reflect the correct number of samples in the sample and divide the number of samples. Secondly, using the user accuracy division method, the number of samples is divided into various categories, and the corresponding basic data information is obtained, and the performance indexes of the roughness and the neural network can be compared.

| Data Set Basic Information |          |          |          |
|----------------------------|----------|----------|----------|
| data set                   | Number of categories | Number of attributes | Number of samples |
| Glass                      | 6        | 9        | 234      |
| Wine                       | 3        | 13       | 178      |

Comparison of performance indexes of rough set neural networks
| method | data set | Average accuracy | Average user accuracy | KAPPA |
|--------|---------|------------------|----------------------|-------|
| C5.0   | glass   | 95.7             | 95.6                 | 95.4  |
| Wine   | 99.2    | 99.6             | 98.4                 |       |
| RMLN   | glass   | 96.4             | 97.1                 | 93.9  |
| Wine   | 98.4    | 97.4             | 97.4                 | 97.4  |

A typical application example: Find the items that are often purchased together (associated knowledge) based on the (shopping) content records that are placed in a shopping bag. Mining the associated knowledge is the market shopping analysis. Between different (purchased) products, the related knowledge of data discovery is different, which will help merchants analyze customer buying habits and help merchants to formulate market strategies [4].

For example, when a customer buys milk, it is also possible to buy bread at the same time or which brand of bread will be purchased. Obviously, the information that can answer these questions will definitely help the merchant to carry out targeted promotion and carry out appropriate shelf merchandise placement. If you can put milk and bread in close proximity, it may promote the sale of these two goods [5].

6. Conclusion
In this paper, the neural network structure of rough sets is analyzed and researched, and the data mining application based on rough and neural network structure is established. After analysis, it shows that using rough set neural network structure for data mining can get good working performance [6]. And it is also an innovative method for semantic rule extraction. In the future, the semantic rule extraction based on the neural network structure of rough sets should be deeply explored and explored.

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