Investigación

NNtex: A toolbox to use the Neural Networks in an easy way

NNtex: Una toolbox para utilizar las Redes Neuronales de un modo sencillo

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1 de octubre de 2012

Abstract

An optimal toolbox: NNtex, which is based on Matlab software is developed in this paper. With the NNtex, the users can process and calculate the data through the simple operations. Through the built-in neural network toolbox in the NNtex, the users can optimize and calculate the input data and get the visual output and analysis results, including tables and figures. At the same time, by adopting the optimization algorithm, the models uses less memory space and has a fast operation, and for large-scale data it can also get the operation result in short time. The NNtex toolbox is applicable to be used in every field of science, and is convenient used for scientific and technological personnel, and it will have a good social value.

Keywords: Matlab, Neural Network, NNtex, Labbtex.

Resumen

En este trabajo se presenta NNtex, una toolbox para Matlab desarrollada para trabajar con redes neuronales de una manera sencilla y óptima. Con NNtex, los usuarios pueden procesar y calcular resultados a través de operaciones simples además de obtener salidas que incluyen tablas y figuras. Al mismo tiempo, mediante la elección automática del algoritmo, los modelos utilizan menos memoria y tiene un funcionamiento rápido, computacionalmente hablando, esto permite el trabajo con bases de datos grandes. NNtex puede ser usada en cualquier disciplina científica y ser utilizado por personal científico o técnico de forma sencilla.

Palabras clave: Matlab, Redes Neuronales, NNtex, Labbtex.

1. Introduction

Artificial Neural Networks (ANNs) is also referred to as Neural Networks (NNs) or called Connection Model. Neural networks are composed of simple elements operating in parallel. These elements are inspired by biological nervous systems. [1] It is an algorithm mathematical model that imitate the neural networks behavior characteristic of animals, and process the distributed parallel information. This network relies on the complexity of the system, through the adjustment of the internal connected relations of the nodes, in order to achieve the purpose of processing information[2].

In recent years, the researches about the neural networks are very popular, till now, a variety of neural network models have been developed and applied in different areas, such as the Back Propagation Neural Network(BP Neural Network), the Radical Basis Function Neural Network(RBF Neural Network), the Linear Neural Networks .etc[3][4][5]. The neural network is used to forecast, classification and identification, optimization and other typical fields, and plays an important role in all the fields. Especially for classification problem, the neural network is widely used because of its short operation time characteristic and the high operation efficiency.

Matlab is a well-known mathematical optimization software, the software is widely accepted and used by the science researchers in many different research fields. The friendly interface and simple operation of Matlab can make it easy to be used by the non-professionals. Matlab software has a toolbox specialized in neural networks: Neural Network Toolbox, which has multiple functions and models for creating and dealing with neural networks, and we can use them to assist the writing of the programs which are created by us.

However, the neural network theory is esoteric and the parameters setting process is relatively complex, and the quality of the parameters setting has great influence for the operation time and the accuracy of the operation result. Although Matlab software has a Neural Network Toolbox, how to use the neural network and how to set the related parameters will be a big difficult question for the normal users, such as engineers and beginners. In the Neural Network Toolbox, it only offers the basic functions of Neural Networks, not includes the ways to choose the parameters values and compare different neural networks. Therefore, we develop the new toolbox: NNtex which is based on the Neural Network Toolbox and NNtex can choose the related parameters and compare different neural networks results in an automatic way. By using NNtex, it will be much more easier to use neural networks for the engineers and beginners. After the running, NNtex uses Labbtex to generate report in an automatic way.

At the same time, through many years of experience and research, we often meet optimization and forecast problems in the transport and logistics research process. Therefore, in order to facilitate the repeated use, simplify the use process, and improve efficiency, we have developed NNtex toolbox. Through the use of NNtex toolbox, the users only by entering the data can get the optimization results and analysis results through the automatic operation of the program. In this way, it will reduce the difficulty and the workload for the users.

In order to ensure the accuracy of the NNtex toolbox operation results, we embedded three different kinds of neural network models in the development process, including the BP neural network, the RBF neural network and the linear neural network. After the user input

the data, the three kinds of neural network will be operated in order, and then get three different operation results. After this, we choose the best result by comparing the results with the receiver operating characteristic curve (ROC Curve)[6]. By using the NNtex toolbox, not only can let the users use the neural network toolbox through more simple ways, but also can choose the best answer from the different networks, and output tables and figures for users to adopt.

2. Description of NNtex

We develop the NNtex toolbox by using the Matlab R2009a software. The NNtex toolbox consists of seven parts, as following:

(1)data input module: provide the data input window for users

(2)data normalization module: normalize the input data, and get the data which is suitable for the model operation.

(3)BP neural network module: construct the BP neural network, this network could select the corresponding parameter and compare the results of different parameters according to the characteristics of the input data, and get the better the BP neural network and results.

(4)RBF neural network module: set up the RBF neural network, this network could choose the corresponding parameter and could obtain the good optimization operation result.

(5)linear neural network module: establish the linear neural network, this network could select the corresponding parameter, and get the good result.

(6)ROC analysis: compare the operation results of the BP neural network, RBF neural network and linear network, obtain the ROC curves and the area under concentration-time curve(AUC) values, and then select the maximum AUC value of the results for best result.

(7)data output: export the running results and acquire the analysis report by using the Labbtex.

The calculate flow chart of NNtex is shown in Figure 1.

3. A real-world example

By using the NNtex toolbox, we can get the research result in the form shown in Figures 2 and 3.

We can see from Figure 2 and Figure 3 that there is an intuitive calculate result which could show the computing process clearly and has a strong persuasion. After we get the research results and figures, we can generate the research report by using Labbtex[7] in the right forms.

4. Conclusion

NNtex is an important and precious toolbox which can solve the practice problems based on the Matlab software. The calculation process of this toolbox is stable, fast and

comprehensive. At the same time, NNtex requires less memory and could solve the large-scale problems in the limited conditions.
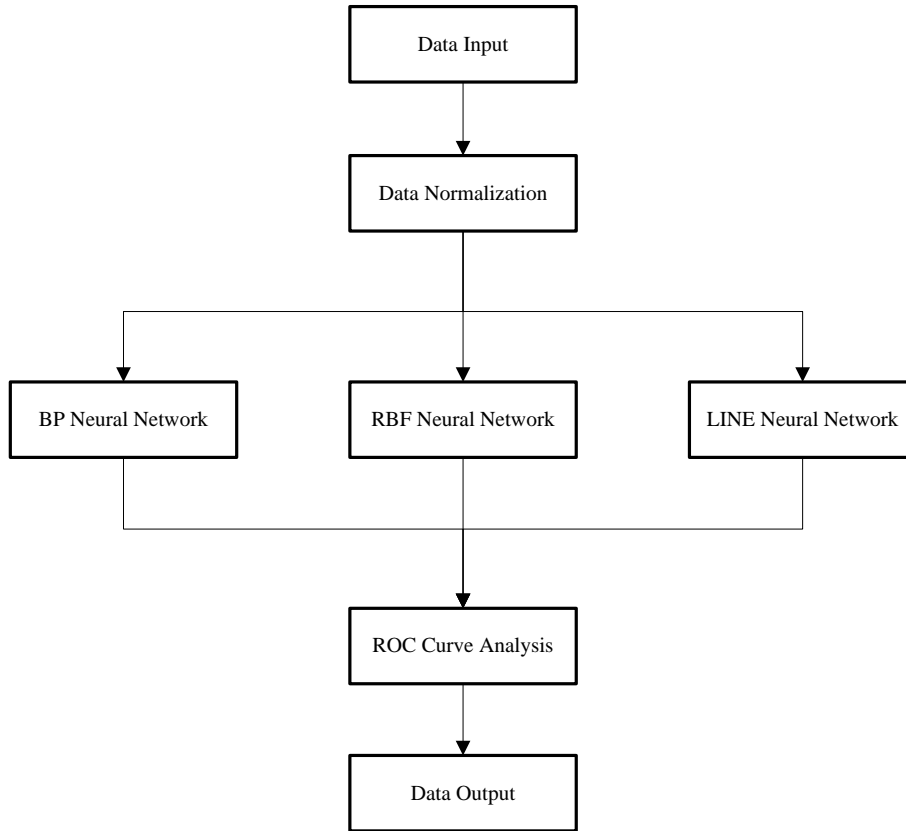
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┌─────────────────┐
│   Data Input    │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│ Data Normalization │
└─────────────────┘
         │
    ┌────┴──────────────────────┐
    ▼         ▼                  ▼
┌──────────┐ ┌──────────────┐ ┌──────────────────┐
│ BP Neural │ │ RBF Neural   │ │ LINE Neural      │
│ Network   │ │ Network      │ │ Network          │
└──────────┘ └──────────────┘ └──────────────────┘
         │
         ▼
┌─────────────────┐
│ ROC Curve Analysis │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│   Data Output   │
└─────────────────┘
```

Figure 1. Calculate flow chart of NNtex.
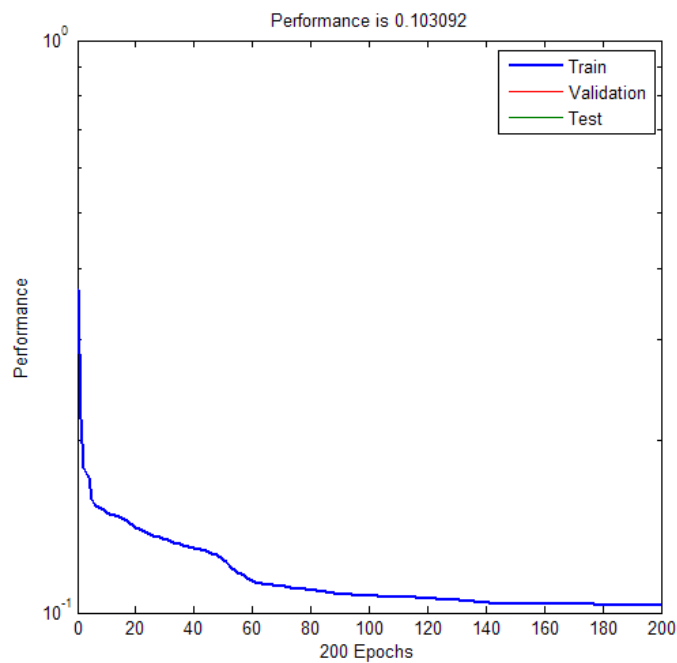
Performance is 0.103092
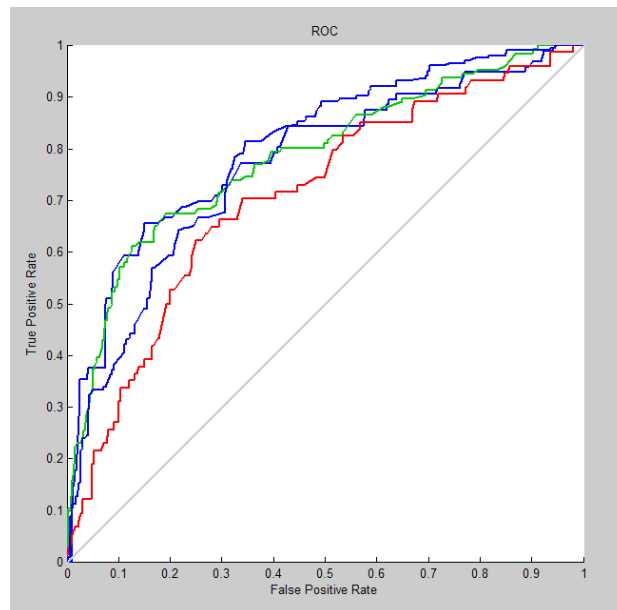
Figure 2. Calculate result of Neural Network

Figure 3. ROC analysis result

In the future, our research group will develop the toolbox which has more powerful functions, such as adding more different kinds of neural networks as contrast and improve the algorithm to improve the operation efficiency.

Acknowledgements

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