Effects of Sleep on Human Body

Lu Wang

College of Mathematics and System Science, Shandong University of Science and Technology, Qingdao, 266590, China

Abstract: Using Pauta criterion to eliminate the abnormal data, the correlation coefficient of sleep quality and each index was obtained by using Pearson correlation coefficient method, finally get the correlation between various indicators and quality of sleep we establish a disease diagnosis model based on neural network. In addition, in view of the influence of the disease on sleep, we put forward reasonable prevention and treatment measures, and stressed that good Mood, good mood is conducive to improving sleep quality. For the effectiveness of the evaluation program, we simulate the mechanism of indicators and sleep quality, and get the indicators of sleep recovery to normal, indicating that the program is effective.

Keywords: Correlation analysis; Pearson correlation coefficient method; Neural network model; Beers classification algorithm

1. Introduction

This article mainly through to the appendix index data processing, the computation, establishes the corresponding question model, and obtains the science reasonable result.

This paper mainly uses the neural network model to study the problem. The neural network has strong nonlinear fitting ability, and can be used to map any complex nonlinear correlation. The neural network's learning rules are simple and easy to implement by computer. The neural network has strong robustness, memory ability, nonlinear mapping ability and strong self-learning ability, so it has a great application market.

2. Restatement of the Problem

2.1. Problem background

According to the latest report released by China Sleep Research Association, the rate of insomnia in adults is as high as 38.2%. Among them, 73% of insomnia suffer from insomnia, but have not paid attention to their sleep problems. The people with sleep disorders are becoming more and more huge. Sleep medicine research in China is in its infancy, and the public is not aware of sleep disorders. Only a few patients choose to seek professional doctors. Now sleep problem is not only a medical problem, but also a social problem that affects people's physical and mental health, work efficiency and so on

2.2. Restatement of the problem

In a person's life is 1/3 of the time in a sleep state, a good sleep can regulate the physiological function, maintain the balance of the nervous system; sleep bad or insufficient, will make people feel tired, distracted, so the work and learning efficiency is relatively low; severe insomnia

may even cause autonomic nerve dysfunction, cause in various system imbalances and problems. To improve the quality of sleep, we must first determine the standard of sleep quality and the factors that affect sleep quality. Generally speaking, if the sleep time is more than 30 minutes, it belongs to the category of insomnia. There are many factors that affect sleep quality, which are divided into objective factors (environmental changes, bedtime tea or coffee, etc.) and subjective factors (generally life stress, emotional loss, mental excitement, etc.). So it is the original intention of this topic to establish a mathematical model to analyze the influence of sleep quality on human health, so as to improve people's cognition of sleep and help to solve the problem of sleep disorders.

Combined with the relevant data in the annex, refer to the relevant information, answer the following questions:

(1) According to the data in the annex I, the relationship between the index and sleep quality is analyzed. If there is no correlation between one or several indexes and sleep quality, it will be found or deleted.

(2) Analysis of the relationship between diagnostic results and sleep.

(3) Suppose you were a doctor, what kind of diagnosis would you make for patients, about the data of annex three? Give your diagnosis.

(4) How do we arrange the rest time scientifically to keep us in good health? Develop appropriate sleep schedules and evaluate their effectiveness.

3. Problem Analysis

The topic requires the establishment of a model describing the relationship between human sleep quality and the factors that may affect sleep quality, which clearly belongs to the problem of correlation analysis. To solve this problem, we should first determine the relationship between indicators, excluding irrelevant indicators, and

then use the correlation coefficient to measure the relationship between variables. First, we preprocess the data and eliminate the abnormal data, and then use the Pearson correlation coefficient method to solve the correlation. If the correlation coefficient |r| is close to 1, it proves that the correlation between the variables and sleep quality is higher.

We have established a neural network model and found the relationship between the sleep indicators and the disease, then the problem only need to bring new data into the model that has been built. Be-cause of the diversity and complexity of data to the BP neural network algorithm has limitation, we need the output of the anti normalization, using Bias classification algorithm to predict, finally obtains the number of each patient's disease, the corresponding corresponding types of diseases.

4. Model Establish and Evaluation

4.1. Data preprocessing

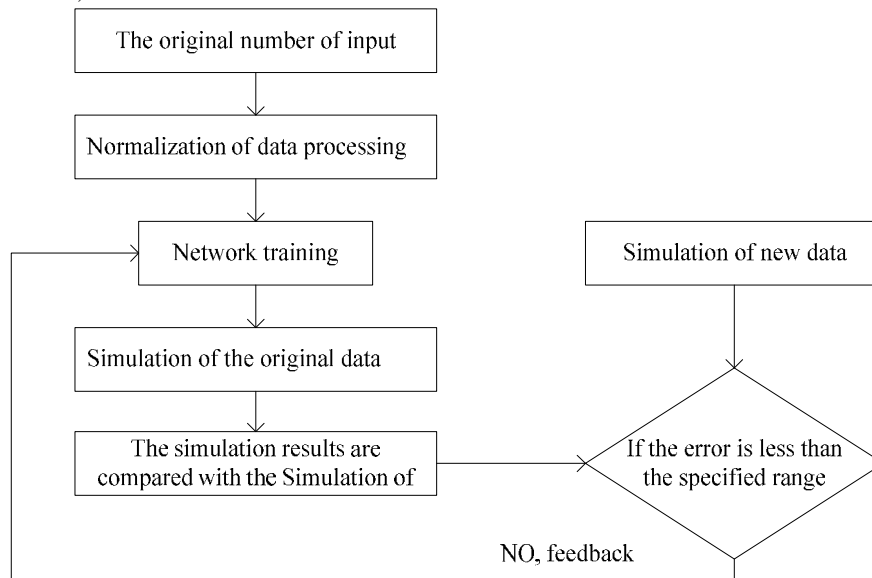Because the data from clinic records, due to negligence, read the wrong operation data or subjective factors correctly, improper operation, the instrument will make sud-den arrhythmia, measurement data with subjective errors, which seriously affect the results of the study, therefore, when processing the data should be removed with numerical gross error from. However, judging whether a data contains gross error and decide when to be especially careful, must have sufficient theoretical basis, otherwise it will reflect the objective facts or data error elimination, will really contain gross errors in the data retention, resulting in destruction of the human reliability measurement data Then that is a gross error of abnormal values, need to be removed. Data standardization Judged by the Pauta criterion, get the appendix eliminating abnormal data after a data, the data were standardized by SPSS, to facilitate analysis of the subsequent correlation.

4.2. Construction of disease diagnosis model

In order to study the relationship between different sleep indexes and the condition, we established the learning samples of neural network according to the data of Annex II, and established the disease diagnosis model based on neural network by using the strong approximation ability of neural network.

Figure 1. Flowchart of neural network

5. The Basic Principle of Artificial Neural Network

Artificial neural network is an information processing system that imitates the function and structure of the biological nervous system. Neuron is the basic unit of artifi-cial neural network [3], and it is generally a nonlinear element with multiple input and single output [4]. A neuron with r multiple input components is shown in Figure 2, among it, the input components are connected with the weight components which multiplies with it. And after the sum, the input of activation function can be formed.
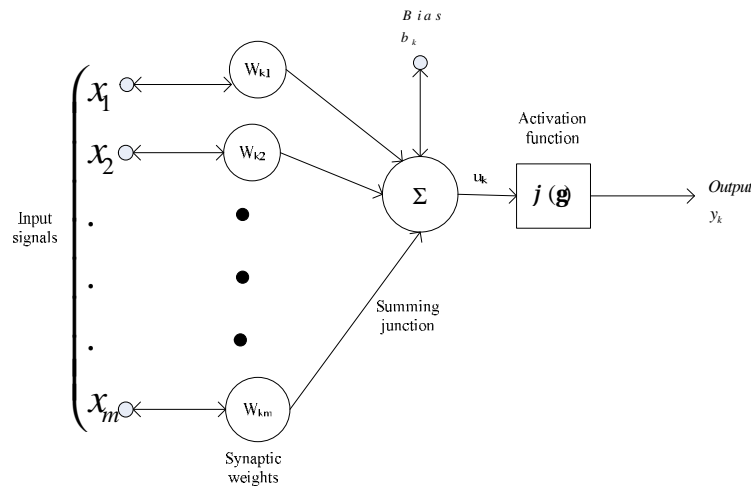
Figure 2. Artificial neuron model

5.1. Network initialization

Because the original data can not meet the training requirements of the neural network, we normalize the data set:

$$y = \frac{(y_{max} - y_{min})(x - x_{min})}{x_{max} - x_{min}} + y_{min} \tag{1}$$

Among them, $y_{max} = 1, y_{min} = -1$, x is the data that needs normalization

5.2. Input and output of neurons in hidden layer are calculated

In Figure 1, X1, X2…... X7 is the input of neurons, that is, the information of the axons from the seven neurons of the anterior stage, A, is the threshold of I neurons; Wi1, Wi2...... Wi7 Are I neurons to X1, X2, respectively...... The weight coefficient of X7, that is, the efficiency of synaptic transmission; Yi is the output of I neurons; f [=] is the excitation function, which determines that I neurons are transported by X1, X2...... When the X7 stimulus reaches the threshold, how does it output.

From the neuron model, we can get the mathematical expression of the neuron model:

$$\begin{aligned} Ui &= \sum_{j-1}^{n} w_{ij} x_j - q_i \\ Yi &= f(Ui) \end{aligned} \tag{2}$$

We refer to the following formula to determine the number of neurons in the optimal hidden layer.

$$\begin{aligned} 1 &< n - 1 \\ l &< \sqrt{(m+n)} + a \\ 1 &= \log_2 n \end{aligned} \tag{3}$$

Among them, N is the number of nodes in the input layer; L is the number of hidden layer nodes; m is the number of nodes in the output layer; A is the constant between 0~10.

Learning speed also plays an important role in BP neural network. We finally decided to learn at 0.01 and the speed of training was 1000.

For this problem, we use the additional momentum method to solve the weight learning formula with additional momentum:

$$w(k) = w(k-1) + \Delta w(k) + a[w(k-1) - w(k-2)] \tag{4}$$

The above learning process is realized by using function traingdm in Matlab neural network toolbox.

6. Improved Model

6.1. Improvement of neural network I with genetic algorithm

The neural network is used to deal with the nonlinear relationship, the relationship between the input and output can be determined (there is a nonlinear relationship), can use the neural network self learning (with training data set with explicit input and output), after training weight value determination, we can test the new input.

Genetic algorithm is used to solve the problem of the most valuable, biological evolution, the better jig. More flexible, without limitation, the only difficulty is the choice of coded chromosomes and evaluation functions.

6.1.1. Data preprocessing in the application of pattern classification

Generally speaking, the feature extraction of the success of pattern classification plays a key role in the result. For the NN selection of training data is a new technology of. Kelly and Davisll by using the GA parameter selection of data sets and each feature of the scale factor using GA, to reduce the data between the intra class Difference, increase class differences thus, greatly improved the network for pattern classification performance of. Chang and Lippmannll in a complex speech recognition examples not only the original 153 features using GA compression to 33 characters, and use the new features of the

GA synthesis. In this way, the characteristics of compression not only improves the performance of neural network classification, and the amount of computation is greatly reduced similarly, the accident of Guo and Uhrlg also use GA feature extraction method to monitor NN training edge power plant, simulation experiments show the effectiveness of this method. The difference is that their fitness functions consider the number of inputs in addition to the training error.

6.1.2. The BP algorithm parameters, such as learning rate and moment, are adaptively adjusted by using the idea of evolution.

Assume that the network weights are updated depends only on local information, such as the input and output signal and the current signal, training connection weights, and learning rules are formulated as linear functions of the four independent variables and their products of 22. Coefficients of these 10 variables and a scale parameter coding in chromosomes, learn the rules of evolution the goal is to determine these coefficients. The network structure in the experiment without hidden layer, there is only one output node, the input of the network from the 2 to 7 range, with a variety of examples of linear separability of them for testing and evaluating the learning rules.

6.1.3. Using GA to explain and analyze neural network

Different from the design by GA NN, some researchers try to use GA to explain and analysis of neural network Suzuki and Kakazu in the domain of attraction of the associative memory model using GA. in the domain of attraction in the memory process of monotonous change phenomenon, in order to analyze this phenomenon, they abstract the basic features of this phenomenon for ten polynomial function, and then use GA to optimize the coefficients of the polynomial. Eberhart et al by GA to analyze the decision surface of the neural network, the neural network explanation provides a new path selection.

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