

From the Perspective of Computer Engineering: Research on Digestive Diseases based on Bioinformatics and Genetic Genetics

-- Research and Development of an Innovative Economic Product of Computer Medicine

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Abstract. Background: Irritable bowel syndrome needs long-term neuroscience detection after medical engineering modeling, during which time, computer engineering is needed to complete database collection. Research methods: The research team designed this model after constructing the illusion of intervention on different sweeteners and sugars. At the same time, the artificial intelligence neural system combined with data to predict which combination of sweeteners and sugars is likely to cause disease, which combination of sugar and glycogen may lead to irritable bowel syndrome in patients, and elaborate the neural network mechanism from the perspective of calculation. Results: Through experimental data processing and analysis, the research team completed the design of the model and established a complete computer network path. Conclusion: The model can be popularized in Europe, Russia, Belarus, China, Malaysia and other regions. After cooperation with Chifeng University, supported by the Autonomous University of Barcelona in Spain and the National University of Belarus, a more in-depth comparative experiment will be carried out to find a more accurate molecular mechanism.

Keywords: Gastroenterology; Irritable Bowel Syndrome; Computational Neuroscience.

1. Background

The latest research shows that the characteristics and advantages of artificial neural network are mainly reflected in three aspects: first, it has self-learning function. For example, when realizing image recognition, the network will slowly learn to recognize similar images through self-learning function only after inputting many different image templates and corresponding recognition results into the artificial neural network. The self-learning function is particularly important for prediction. It is expected that the future artificial neural network computer will provide economic forecast, market forecast and benefit forecast for mankind, and its application prospect is very broad. Second, it has the function of associative storage. This association can be realized by using the feedback network of the artificial neural network. Third, it has the ability to find optimal solutions at high speed. Finding the optimal solution of a complex problem often requires a large amount of computation. Using a feedback artificial neural network designed for a certain problem and giving full play to the high-speed computing ability of the computer, the optimal solution may be found quickly. This technology can be applied in clinical medicine to detect the pathogenesis of gastroenterology - neuroscience [1-5].

2. Researching Method

As shown in Figure 1. The research team completed the construction of the overall medical intervention mechanism by designing a network data collection model. The research team showed the patient data selection criteria for irritable bowel syndrome in Figure 1, through which the necessary functions can be completed. Because during the training of neural network, more detailed and non-interference data can improve the accuracy. the integration of different sugars and sugar substitutes into the overall model is achieved in the first step. It is necessary to classify different sweeteners and sugars into different groups, and then classify them according to the situation of different patients [6-9]. More detailed classification can get more data and improve the accuracy of prediction.

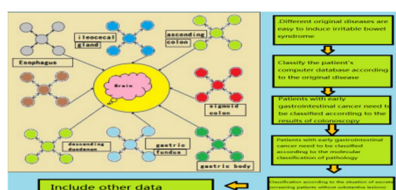


Fig 1. Data selection criteria based on neuroscience and primary diseases

Through necessary research, it is found that artificial intelligence can assist this process in the current research. After data collection, data cleaning and data collation, a more accurate platform is provided to complete this purpose. The accuracy of neural network is very relevant to the key information of neuron recognition. Therefore, in Figure 1, we mark the primary disease of patients that need to be distinguished, because irritable bowel syndrome is a disease of unknown origin, our classification criteria are very necessary.

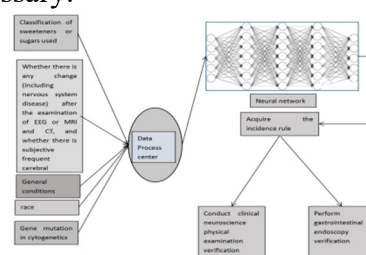


Fig 2. Training method and working mechanism of identifying key information using neural network

As shown in Figure 2, we list the clinical data to be identified in the hidden layer. In most cases, MRI is recommended for neurological diseases. For two reasons, CT has radiation damage, and the resolution of CT soft tissue is far lower than that of magnetic resonance, so magnetic resonance is usually recommended. Moreover, CT examination has a great feature. It is very fast and can quickly determine whether there is bleeding. If there is no bleeding, stroke patients should consider cerebral infarction. Of course, the purpose of our model is to find micro-infarction and lacunar infarction. Because there are no clinical symptoms, of course, abnormalities found in the monitoring process also need to be reported experimentally, depending on whether to clear this data that may have interference conclusions. It is also a function of this model to quickly determine whether there is a lesion, how large the infarct area is, and which vessel may be infarcted. Of course, this is not the decisive factor, but one of the functions of computer imaging. Current research shows that irritable bowel syndrome is also related to nervous system diseases, so it is necessary to include it when training neural networks. This is also one of the favorable supporting data sources.

In the convolution neural network, we think that the abnormal part of the normal structure needs to be identified. The first point of the model is to predict the target by the whole neural network. The prediction target is mainly aimed at the fracture problem in emergency science. Therefore, in the training of this neural network, a large amount of data needs to be included, and the images of anatomical anomalies need to be convolved, merged and predicted. Secondly, according to the

research team, the activation functions required by this neural network are mainly divided into three categories.

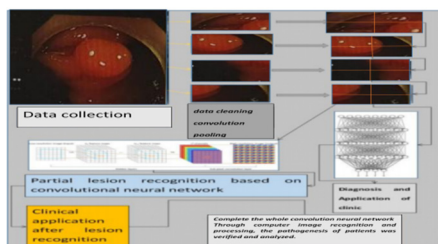


Fig 3. Working mechanism of computational neuroscience: application of neurons and activation functions

$$F(X) = \max(0, x)$$

Correction linear unit-relu is the first suitable activation function, The advantage of ReLu activation function is that when gradient descent (GD) method is used, the convergence speed is faster. Compared with ReLu, only one threshold value is required, that is, the activation value can be obtained, and the calculation speed is faster. This is also a commonly used activation function in deep learning, but there are also some shortcomings for specific work. When the input value of Relu is negative, the output is always 0, and its first derivative is always 0, which will cause the neuron to be unable to update parameters, that is, the neuron will not learn. This phenomenon is called Dead Neuron. Therefore, the research team expanded and proposed an optimization strategy for this activation function. In order to solve the shortcomings of the Relu function, the research team introduced a Leaky value in the negative half interval of the Relu function, so it is called the Leaky Relu function.

$$y = \max(0, x) + leak * \min(0, x)$$

Compared with ReLu, leak gives a non-zero slope to all negative values, and it is a small constant large ai in this way, some values of the negative axis are retained, so that all information about the negative axis is not lost). The research team believes that the ladder function is also applicable to the training of this neural network.

$$\varphi(v) = \begin{pmatrix} 1 & V \geq 0 \\ 0 & V \leq 0 \end{pmatrix}$$

Corresponding output value- Y_k is as follow.

$$y(k) = \begin{pmatrix} 1 & Y_k \geq 0 \\ 0 & Y_k \leq 0 \end{pmatrix}$$

In this model, Y_k is as follow.

$$Y_k = \sum_{j=1}^p W_k x_j - \theta_k$$

In the case of highly bionic neurons, the third activation function can improve the working efficiency of the neural network. To sum up, the three activation functions can be selected. At the same time, the working mechanism of the neural network filter is as follows. The filter is a matrix with the size of $m * n$, which is used to detect specific features in the image. Different filters have different parameters. When filtering the image, the filter will perform point, multiplication with each area of the same size. If an area of the image is very similar to the features detected by the filter, the filter will be activated when the filter passes through the area, and a very high value will be obtained. On the contrary, if an area of the image is very different from the features detected by the filter, the filter will not be activated or the value obtained will be very low, in short, we have marked the possible lesion sites in spinal surgery in Figure 3, so the operation mechanism of the overall convolutional neural network is as follows, in image processing, the image is input into the neural network in the form of a two-dimensional matrix. Given an image.

$$X \in R^{M \times N}$$

Proposed filter

$$W \in R^{U \times V}$$

This mathematical law exists during this period.

$$U \ll M, V \ll N$$

The convolution is as follows (the result of medical image feature extraction)

$$Y_{IJ} = \sum_{\mu=1}^U \sum_{\nu=1}^V W_{\mu\nu} X_{I-\mu+1, j-\nu+1}$$

Therefore, from the perspective of the overall model, the mechanism is currently feasible, and the activation function mechanism and convolution can complete the neural network. Therefore, more data will help the accuracy of neural network.

We put forward the innovative content of capsule endoscopy here, which can allow capsule endoscopy to enter the human body and identify the lesions through neural network, and then transmit the information to doctors through the Internet of Things. Its core mathematical modeling has been described in detail above, and this data can be trained through a large number of clinical samples.

3. Discussion

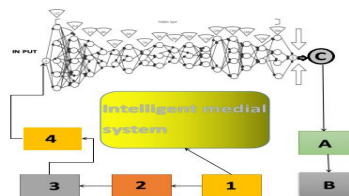


Fig 4. Working mechanism of medicine and AI technology

As shown in Figure 4, we built a genetic engineering calculation model design based on artificial neural network. It can be seen from the cytogenetic mechanism that the susceptibility genes of esophageal cancer are very common in parent-child transmission. Therefore, we also include the smart city preventive medicine model supported by smart medicine into the overall work of gene screening and report encryption. The research team designed the function of neurons in artificial neural network computing strategy. After entering the necessary data in the input part, the hidden calculation layer will organize and calculate the data according to the 12 conditions of the tested person. In the 1-12 hidden calculation layers, we focused on age, sex, BMI, daily caloric value, gene mutation, gastrointestinal symptoms, cancer serum antibody concentration, parental gene mutation, frequency of eating food with temperature higher than 48 °C, salt quality, daily time, and negative emotion frequency of subjects (calculated by week).

1: Through public health management plan (information collection based on mobile phone client)

2: Data enters the information processing center for data standardization

3: Data is stored in the background processing center

4: The medical center is ready to sort out and clear the data, enter the artificial neural network for mathematical calculation, and try to generate a prediction report on the incidence rate of esophageal cancer

C: Report generation A: Report encryption B: Report storage

This is also the overall mechanism of low-cost in-depth learning, and the necessary program function design of in-depth learning is completed in the above steps.

As shown in Figure 5, we marked the mutation of susceptibility gene. In the computational teaching of genetics, we put forward this strategy to solve the difficulties in the current core prediction target of biomedicine. Genes are on chromosomes. Chromosome changes lead to gene mutations. The fusion of the above genes into the overall prediction model has certain supporting significance.

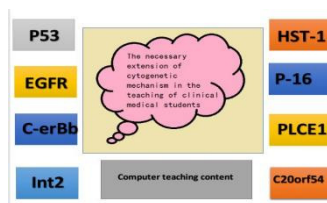


Fig 5. Working mechanism of medicine and Gene

4. Experimental Design and Experimental Results

The clinical data of 78 patients with IBS ranged from 20 to 56 years old, with an average age of 38 years; 40 females and 38 males; The main symptoms were abdominal fullness in 18 cases; 48 cases with abdominal pain and diarrhea as the main symptoms; Constipation was the main symptom of 12 patients. There were 46 patients suffering from insomnia, anxiety, depression and dizziness. Rome II diagnostic criteria were used in all patients. The main clinical manifestations are abdominal pain, abdominal distension, diarrhea and constipation. In the past 12 months, there have been at least 12 weeks (not necessarily continuous) of related symptoms, accompanied by at least 2 of the following characteristics: 1. Symptom relief after defecation 2. Symptoms are accompanied by changes in the number of stools 3. Symptoms are accompanied by changes in stool characteristics. Laboratory, B-ultrasound, X-ray and endoscopic examinations have ruled out related organic diseases and known causes. Cognitive therapy: Cognitive therapy is a short-term psychotherapy method aimed at establishing the correct cognition of patients with irritable bowel syndrome (IBS). By introducing relevant gastrointestinal anatomy and physiological knowledge to patients, patients can understand the popular science knowledge about IBS, correct their misunderstanding of the disease, correctly understand the benign nature of their disease, alleviate or eliminate psychological barriers, and relax treatment: through muscle relaxation training, they can reduce the tension of autonomic nerves, correct the intestinal dysfunction caused by tension, and improve symptoms. This treatment is mainly used for patients who have obvious anxiety, but have no psychological disease and are ineffective after general treatment.

Use medicine, biology, psychology and other therapies for treatment, see Chinese clinical guide for details.

Results The symptoms of all patients were significantly improved. After 3 to 6 months of follow-up, except for 12 cases with occasional recurrence of symptoms, the remaining 66 cases were all in good condition

5. Conclusion

Through model design, the data source of gene mutation - nervous system situation - daily nervous system changes - patients' intuitive feelings have been constructed. After in-depth learning of neuroscience through calculation, necessary conclusions can be obtained under the intervention of sweeteners and sugars. This model has strong global applicability and is suitable for promotion. The model can be popularized in Europe, Russia, Belarus, China, Malaysia and other regions. After cooperation with Chifeng University, with the support of the Autonomous University of Barcelona in Spain and the National University of Belarus, a more in-depth comparative experiment will be carried out to find a more accurate molecular mechanism.

Acknowledgments

The authors gratefully acknowledge the financial support from China National Nature Fund: 31970558 funds, The top four authors of this article have jointly undertaken this work, and the ranking order does not mean different contributions.

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