Biomedical Engineering Research: Computer Translating and Teaching System and Neural Network

Yueyin Liu [1], Weichen Si [2], Huang Xvshang [3], Liangyu Li [4], Yi Qin [5, *], Yixian Lin [4]

[1] Institute of Foreign Languages, Chifeng University, Chifeng,12204, China

[2] Shanghai University of Traditional Chinese Medicine, 200000, Shanghai, China

[3] Medical School of Hunan State Medical University, 12204, China

[4] Business School of Belarusian National University, Minsk, 220004, Belarus

[5] International Sakharov Ecological Institute of Belarusian State University, Minsk, 220004, Belarus

* Corresponding Author Email: liangyuli0823@gmail.com

Abstract. In the research on medical students, the research team obtained the idea of using English teaching to cultivate interdisciplinary talents, and established a computer teaching model to predict the incidence rate of cancer through the use of computer engineering based in-depth learning and oncology. Through the situation of susceptible gene mutation and computer imaging after chromosome staining, an algorithm teaching model using convolutional neural network and linear function is proposed. This model solves the problem that computer engineering students lack knowledge of medicine. This model can enhance medical students' understanding of applied mathematics and neural networks, provide new ideas for the medical community to comprehensively promote in-depth learning, and design social experiments, carry out data analysis and data visualization. The research team analyzed and reported this situation, summarized and communicated.

Keywords: artificial intelligence, technology, computer model, education information system, genetics, archives management, computer system. English teaching.

1. Introduction

In the latest frontier research, the mathematical mechanism of the artificial neural network has been explored. Therefore, the fusion of activation functions can enable medical students to deeply understand the meaning of deep learning, and avoid the wrong understanding of learners in the research of neurobiology and computational neuroscience in the field of neuroscience. For the application of linear functions in activation functions, it needs to be different from the mechanism of chemical signal transmission between synapses[1-6].They also use English to help them learn, and use genome technology, computational neuroscience and nuclear physics to complete the overall mechanism of nuclear radiation accumulation - gene mutation prediction - disease occurrence prediction - preventive medicine and intervention[7].The research team demonstrated and analyzed this.

2. Engineer model design

As shown in Figure 1, The As shown in Figure 1, the research team showed the gap between the signal transmission mode of neuroscience and the artificial neural network in detail. In this gap, the overall artificial neural network algorithm involves data cleaning, data processing, etc. It is easier for medical students to understand this kind of related concepts. Because in medical neuroscience, the transmission mode of neurons is the key learning content for medical students, but for this model imitated by neural networks from neuroscience, this network is only similar to the information transmission mechanism of human brain, so it is necessary to highlight the difference between neural networks and human brain nerves.

In neural networks, the teaching of activation functions, whether sigomid functions or other functions, is very strange to medicine. Therefore, to correctly understand deep neural networks, medical students must use computer teaching to understand activation functions. In neuroscience, connections between neurons rely on synaptic transmission. Neural networks imitate chemical signals transmitted by synapses, A mathematical activation function is proposed. The function of the activation function is very limited, and even does not want to do with the chemical molecules in neuroscience. This is only a means of mathematical modeling. Therefore, medical students need to objectively recognize the knowledge of the activation function in order to understand and use neural networks.

In this paper, we report and implement a neural network used to predict the liking value of the whole teaching idea. We propose a teaching idea using computer, and try to use neural network prediction to accurately locate the people interested in the course. These algorithms and computer engineering have been implemented.

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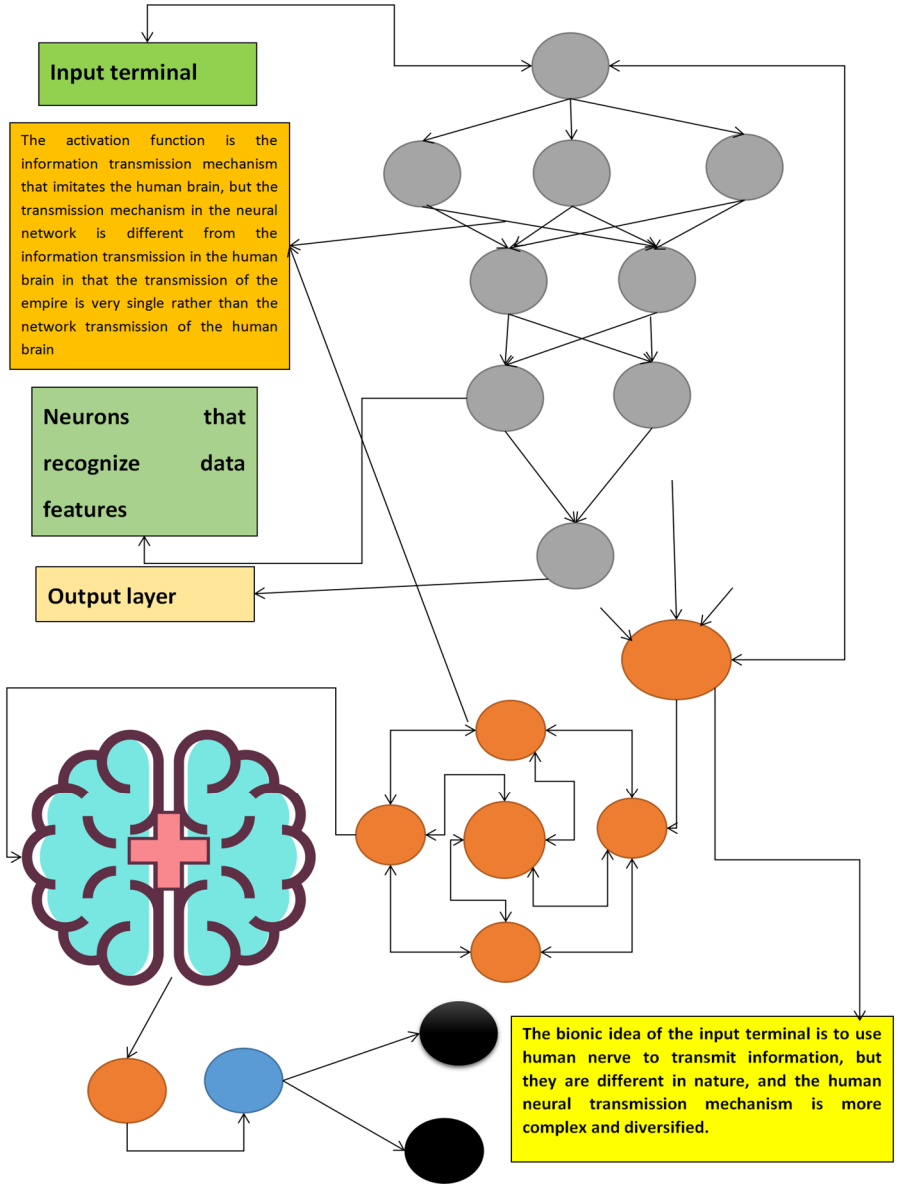


Figure 1. Computer teaching model aiming at the difference between neural science signal network and neural network algorithm of human body of medical students

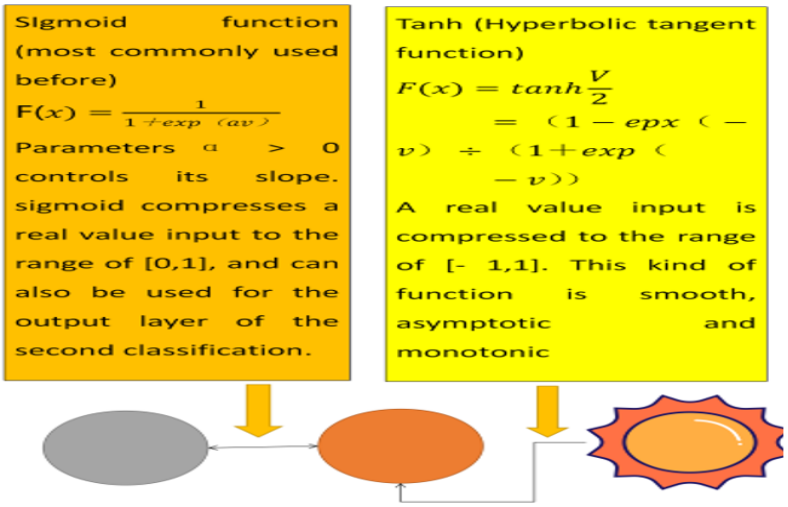


Figure 2. Using Activation Function and Neuroscience Chemistry to Transmit Signals: Key Teaching Contents and Understanding Mechanism of Computer Teaching Objects

As shown in Figure 2, The research team made a comparison between biological neurons and neural network neurons by using activation function and chemical signal transmission mechanism. As an interdisciplinary of applied mathematics, computer science and medical biology, after students correctly understood the use method and definition of activation function according to Figure 2, And after successfully distinguishing the chemical transfer method in neurobiology from the linear function mediated neural network transfer method in neural networks, you can directly understand the meaning of neural networks in machine learning to predict diseases, and you can also directly use this tool in medical genetics. In Figure 2, we describe the two commonly used activation functions and the functions of these two activation functions, and give the meaning of linear functions to medical students in the medium of computer teaching. This way can enable them to understand the whole of neural networks and distinguish them from neuroscience. As an edge discipline of neuroscience, medical students can understand the differences between biological neurons and computational neurons. So as to build an overall network.

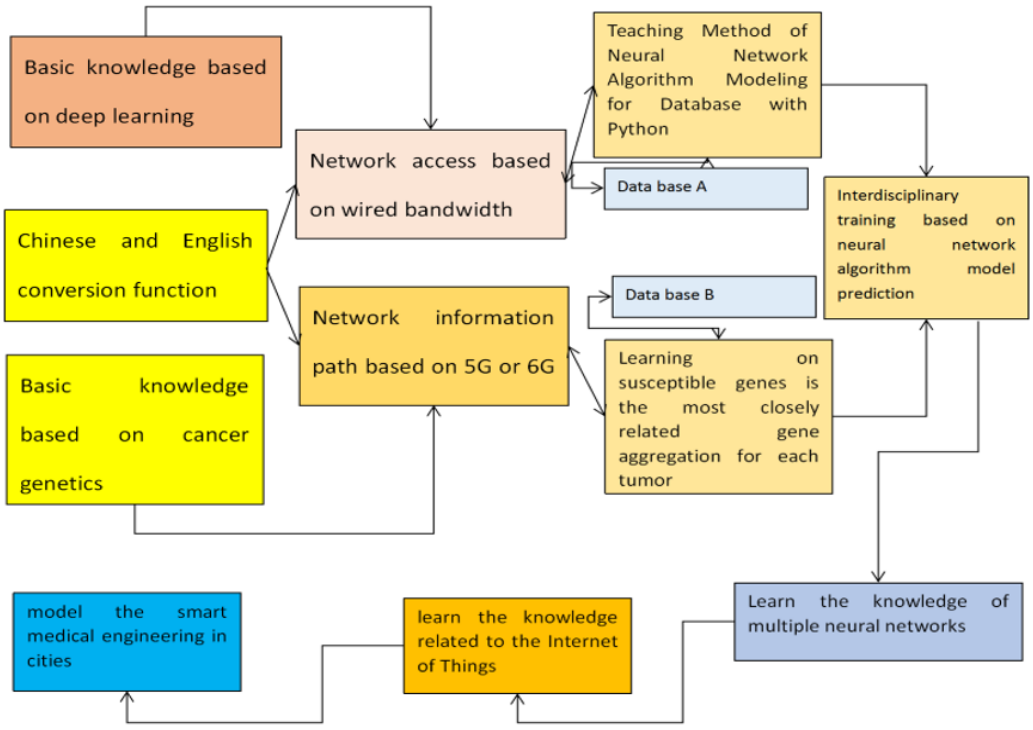


Figure 3. Computer teaching model for disease prediction based on deep learning in genome technology

As shown in Figure 3, Medicine is a rigorous discipline with many trained professionals. However, these talents have different understanding of genetics and immunology. Therefore, based on these two disciplines, especially in the field of preventive medicine, disease prediction can be completed by combining deep neural networks with gene mutation prediction. This mechanism can use computer teaching as a medium, this medium is mainly used to build a preventive medicine network model for medical workers. Therefore, for medical students, in the field of cross frontier modeling of preventive medicine using deep neural networks, it is also necessary for students to learn about susceptible genes, and use English and Russian as the media, because the regions with the most serious gene mutations are Ukraine and Belarus, mainly due to the Chernobyl nuclear accident.

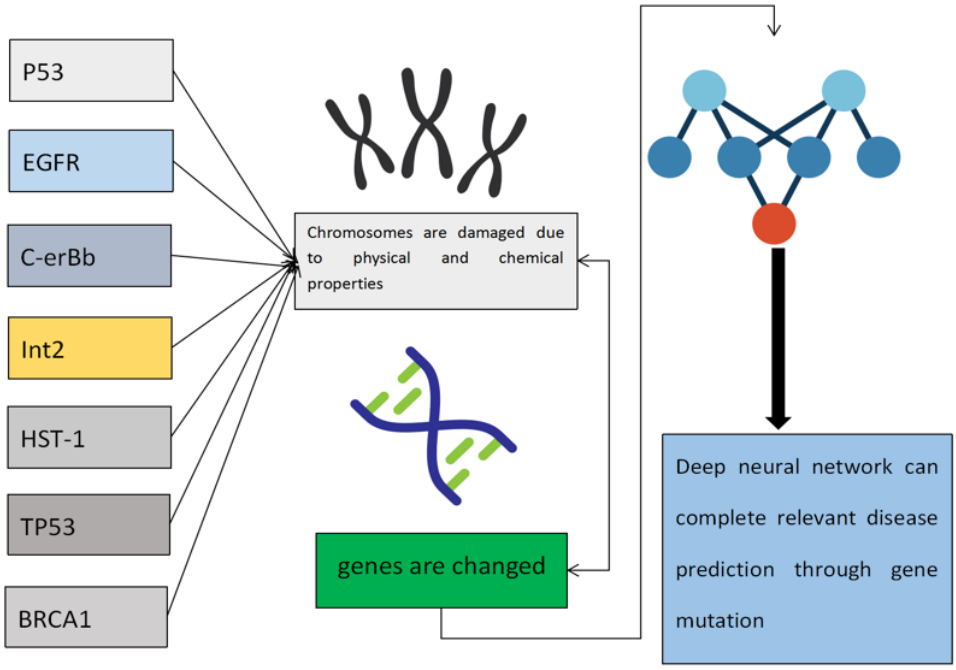


Figure 4. A model for predicting disease occurrence using susceptible genes

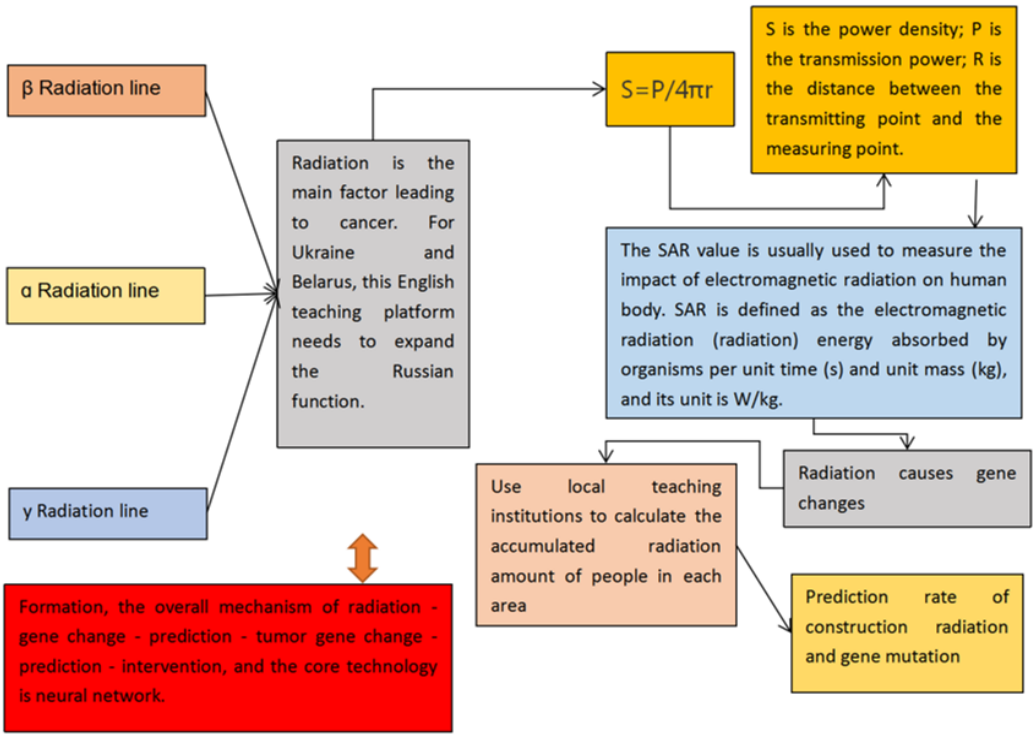


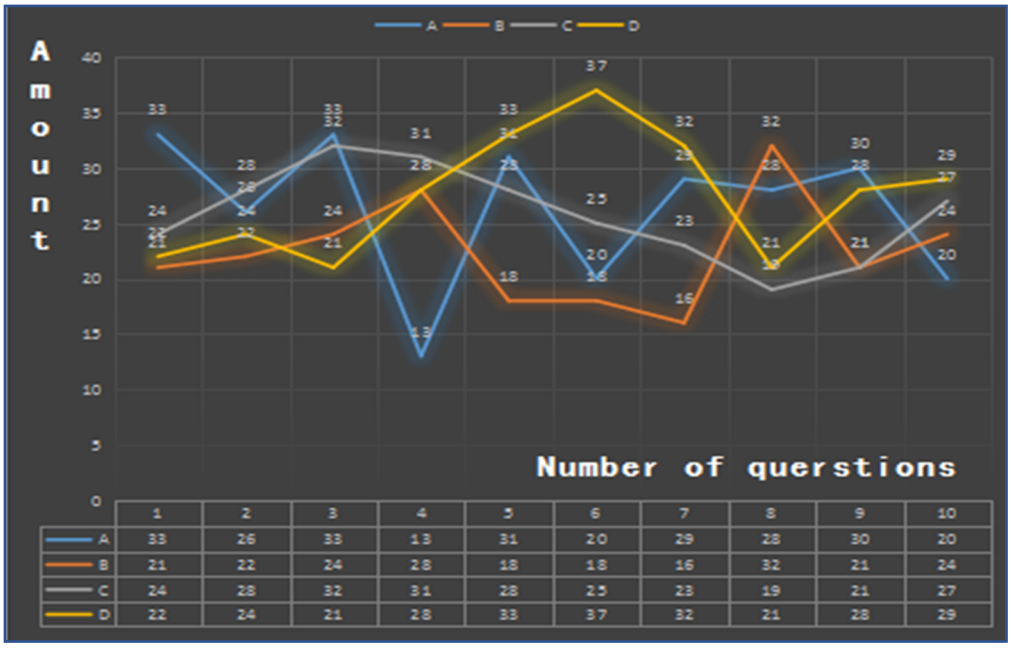
Figure 5. Disease mutation caused by nuclear radiation: radiation amount - mutation - disease occurrence - overall intervention network mechanism

As shown in Figure 4 and Figure 5, we tried to put forward a concept of joint scientific research of medical students with a computer platform radiating to the whole world. Especially for Russian speaking areas, artificial neural networks can be trained by using the mutation rate of susceptible genes of diseases. However, mathematical problems such as the collection of nuclear radiation, the probability of disease mutation caused by nuclear radiation, etc. are still unsolved. The research team believes that using this computer project, The neural network can be trained to explain the mathematical relationship between nuclear radiation and gene mutation by collecting data in Russian area. This task can be accomplished by the section level workers in the Russian region who use our computer teaching model. In general, the research team tried to use computer teaching engineering to design the teaching of artificial neural networks for medical students. The overall aim was to activate functions, feature recognition, data inclusion methods of neural network databases and network information paths. In the field of theological science, the research team proposed the differences between electrical and chemical signal transmission in neurons and neural networks after bionics through artificial neural networks, Using the teaching points in Figure 1-5, students can complete a complete understanding of neural networks, and distinguish between the neural transmission mechanism of biological neuroscience and the neural network signal transmission mechanism. This model will be more conducive to the longitudinal research of artificial intelligence in various fields of medicine in the future. The purpose of our teaching is to apply artificial intelligence technology to disease diagnosis and treatment. Computers can help doctors make statistics on pathology and physical examination reports, analyze and mine patients' medical data through big data and deep mining technologies, and automatically identify patients' clinical variables and indicators. The computer simulates the doctor's thinking and diagnostic reasoning by "learning" relevant professional knowledge, so as to give reliable diagnosis and treatment plans. Intelligent diagnosis and treatment is the most important and core application scenario of AI in the medical field. To complete this core algorithm, clinical institutions need to summarize data. Therefore, taking AI as an interdisciplinary and frontier discipline, driving the development of frontier disciplines and breaking through difficulties can use this computer teaching project.

3. Experiment and data analysis

We also built a neural network model to analyze how different people like our teaching methods, and we think we can use our neural network to predict who likes our teaching methods better, and we can try to get in touch with them. We construct the neural network as follows.There are 10 hidden layers in total, including age, gender, education level, English ability level, whether it is a biomedical related student, whether it likes genes, whether it likes calculus (convolutional neural network), whether it likes artificial intelligence, and how much it likes related courses (predictive value). We cleaned the data of the questionnaire and trained the neural network.

Design of experiment, Objective: To understand the current situation of neuroscience teaching in China and Belarus, and to understand whether there are relevant teaching models and students' level. Participants: Master and undergraduate students of Sakharov International National Institute of Ecology of the Republic of Belarus, clinical medical expert students of Belarusian National Medical University, Chinese students of Moscow University, and students of the Ninth Clinical Medical School of Peking University, ChinaThe main contents of questions 1 to 10 are: immune escape, activation function, gene mutation, neural network algorithm, mathematical modeling, physical computing, radiation medicine, virtual reality technology, and tumor genetics. A is very clear B is very clear C is not very clear D knows a little, Number of participants: 100Test method: questionnaire survey; The results are as follows.



	1	2	3	4	5	6	7	8	9	10
A	33	26	33	13	31	20	29	28	30	20
B	21	22	24	28	18	18	16	32	21	24
C	24	28	32	31	28	25	23	19	21	27
D	22	24	21	28	33	37	32	21	28	29

Figure 6. Data-analysis

Data analysis: As shown in the figure, during the whole experiment process, we believe that the current students in Russian have a good interest in mathematics. At the same time, part of this teaching has been carried out, and our model has the significance of promotion.

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Iteration times (epoch): 50
Batch size (0 means no batch): 4
Learning rate: 0.01
Percentage of test set (%):30
Validation set percentage (%):50
Loss function: meansquareerror
Optimizer: Adam
Hidden layer settings: input data (number of features: 9 columns)
Layer1: tanh
Layer2: softmax
Output layer activation function: soft sign
Final training set loss: 0.0741, accuracy: 0.8966;
Loss of final validation set: 0.1529, accuracy: 0.3333;
Test set loss: 0.1659; Accuracy: 0.5000

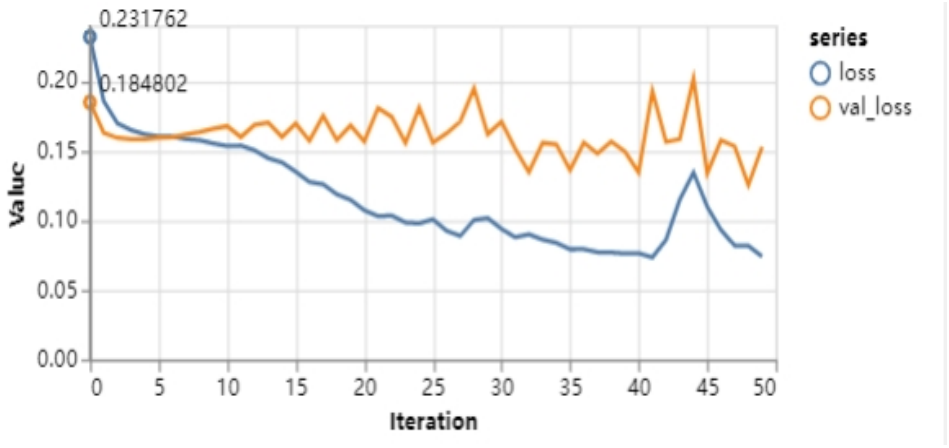

Figure 7. Data-analysis (Model loss)

Loss is the loss value of the training set, Val_ Loss is the loss value of the validation set

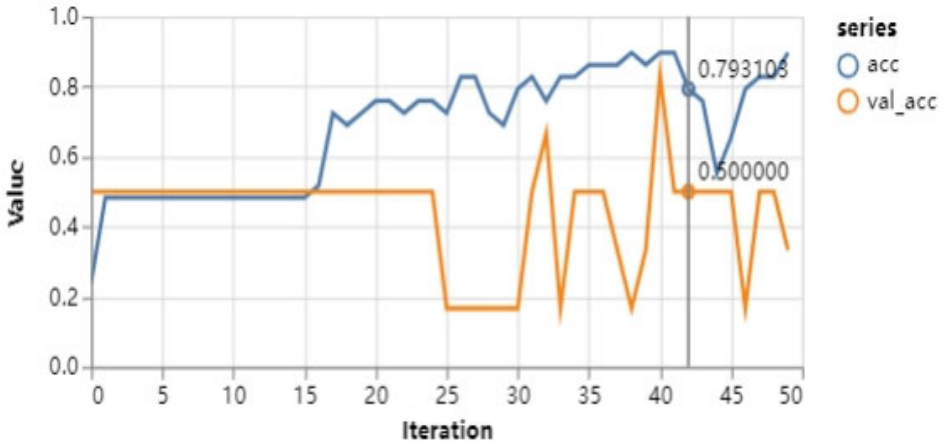

Figure 8. Data-analysis (Model accuracy)

ACC is the accuracy of the training set, Val_ ACC is the accuracy of the validation set.

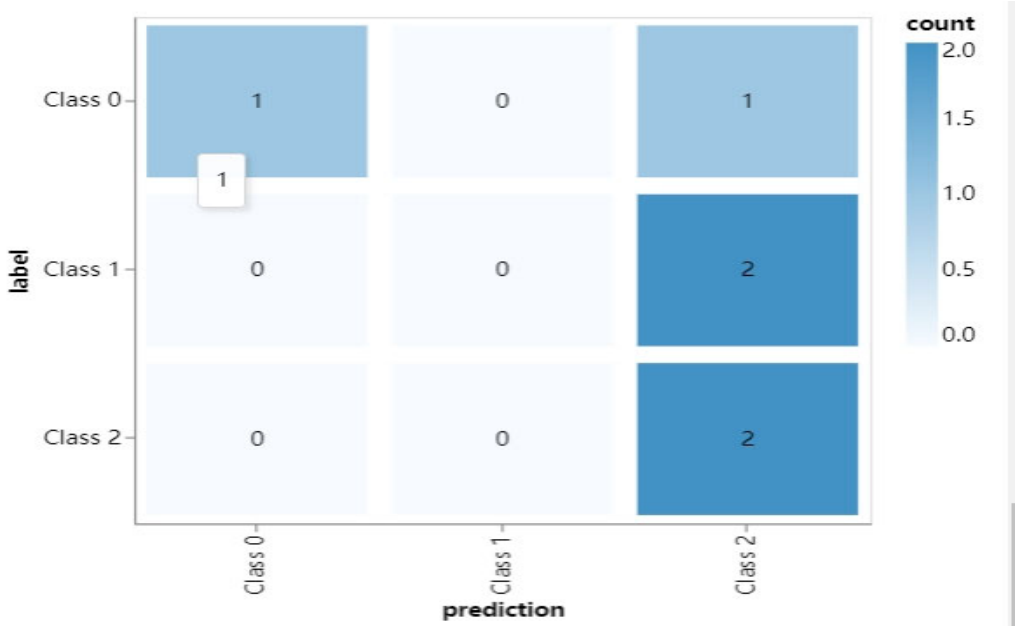

Figure 9. Data-analysis (Confusion matrix)

Although the accuracy is relatively low, we think it may have something to do with the small number of samples. We think we can cooperate with more units to obtain more data to improve the accuracy in the future.

4. Discussion

Because of the complexity and unpredictability of human body and disease, it is very suitable for the application of artificial neural network. The current research involves almost all aspects from basic medicine to clinical medicine, mainly applied to the detection and automatic analysis of biological signals, medical expert systems, etc. The research in the field of anesthesia and critical medicine involves the analysis and prediction of multiple physiological variables, the discovery of some relationships and phenomena from clinical data that have not yet been found or have no exact evidence, signal processing, automatic discrimination and detection of interference signals, prediction of various clinical conditions, and closed-loop control of anesthesia alone or in combination with other artificial intelligence technologies. In the perioperative period and intensive care and treatment stage, a large amount of information needs to be obtained, which can be widely applied to artificial neural network technology and other artificial intelligence technologies in signal processing, auxiliary decision-making expert system based on dynamic data drive, data mining, prediction of various clinical conditions, intelligent bedside monitoring, telemedicine and teaching, medical robots and other aspects. With the continuous emergence of new theories, technologies and methods of ANN, the degree of its imitation of human intelligence has been rising, and it has been widely used commercially in such fields as expert systems, embedded systems, data mining, multi-agent systems, financial engineering, bioinformatics, wireless communications, manufacturing, etc. There are few applied researches in medicine, especially in anaesthesia and critical care medicine, and commercial applications are rare. However, in the perioperative period and intensive care and treatment stage, a large amount of information needs to be obtained, including pure data, biological signals, images, words, etc., both digitally determined information, uncertain and vague complaints, both static and dynamic, both common signs and individual differences, which objectively provides a broad stage for the application of new technologies. Artificial neural network technology and other artificial intelligence technologies can be used in signal processing, auxiliary decision-making expert system based on dynamic data drive, data mining, prediction of various clinical conditions, intelligent bedside monitoring, telemedicine and teaching, medical robots and other aspects to help busy medical personnel serve patients more effectively, safely and economically.

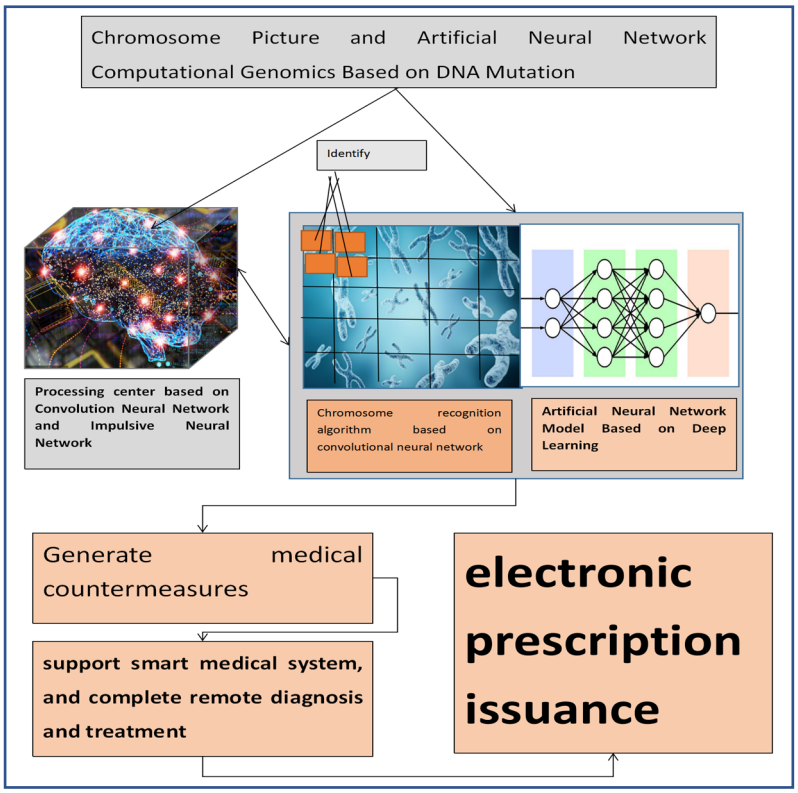

Figure 10. Creation of teaching method based on intelligent technology

As shown in the figure below, the research team believes that more genetics students can be contacted by using computer networks. Through international communication in English as the working language, it is possible to collect chromosome variations of high incidence diseases in various regions, and expand the capacity of the current chromosome database. By expanding the capacity, necessary medical work can be completed, we propose a working model that uses convolutional neural network to directly identify mutations in microscope lines. The fourth innovation of this working model is to design a software that can directly identify images after the microscope is connected to the computer, and expand the computer vision technology with convolutional neural network as the core.

5. Conclusion

The model designed by the research team can deal with many difficulties in medical mathematics. Therefore, the research team believes that it is necessary and feasible for institutions in Eastern Europe to achieve this goal. At the same time, it is more conducive to internationalization to incorporate English into my working language. This computer teaching model, which combines multidisciplinary knowledge such as neurobiology, mathematical modeling, inter neuroscience and nuclear physics, can solve many problems and is worth promoting.

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