

Neural network prediction of atherothrombotic stroke

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Abstract – The cerebrum vascular diseases are one of the most important medical and social problems. They left on the second place in our country in the last decennial event, amongst all reasons to deaths in the population. Stroke occupies the first place amongst the causes of disability, is sewn on enormous economic damage. So preventive maintenance and treatment vascular diseases of the cerebrum is a most actual problem. Exactly forecasting stroke has practical importance in medicine. Analyzing the risk factors it is important to know is situation critical and what preventive measures necessary to undertake. This problem belong to class of the problems, which requiring for decision not clear rules, but experience and knowledge previous situation. The feed forward neural network is used for decision of stroke prediction. The risk factors are the neural network inputs such as: an arterial hypertension, sugar Diabetic, smoking, ischemic attacks, violation of lipide exchange. The neural network output determinate the inset risk degree. The neural network train the back propagation algorithm.

Key words –neural network, stroke, vascular diseases, risk factors .

Introduction

The cerebrum vascular diseases are one of the most important medical and social problems for state of health nations, because they have heavy consequence. They left on the second place in our country in the last decennial event, amongst all reasons to deaths in the population. Stroke is a type of cardiovascular disease. It affects the arteries leading to and within the brain. A stroke occurs when a blood vessel that carries oxygen and nutrients to the brain is either blocked by a clot or bursts. When that happens, part of the brain cannot get the blood (and oxygen) it needs, so it starts to die. When part of the brain dies from lack of blood flow, the part of the body it controls is affected. Strokes can cause paralysis, affect language and vision, and cause other problems. Treatments are available to minimize the potentially devastating effects of stroke, but to receive them; one must recognize the warning signs and act quickly! Though 2/3 strokes occurs beside sick senior by 60 years, sharp breaches cerebral circulation of the blood present the essential problem and for persons of the able-bodied age.

The whole class of the problems exists, which require for decision not clear rules, but experience and knowledge previous situation. Presenting experience provides the possible correct decision in that event even we have given situation never met previously. The experienced physician will put the diagnosis faithfully even exists the distorted picture a symptomatic diseases, which he never observed.

It is enough broadly used neural network in medical diagnostics today. Neural network present itself nonlinear systems, which allow much best to classify the data, than

usually used linear methods. In exhibit to medical diagnostics they enable to raise specificity of the method vastly, not reducing its sensitivity.

Discussion

Neural network capable to work with big set parameter, which influence to put diagnosis and they do impossible to value their for person. Neural network capable to come a conclusion, relying on hidden regularities, which are revealed them, in multivariate data.

Diagnostics is quotient event to categorization event; moreover the most value presents categorization that event, which is absent in training neural network set. This is advantage a neural network technology - they capable to realize such categorization, generalizing former experience and using it in new events.

There is varied possibilities of the using neural network in medicine, and there is varied their architecture. On base of the forecast separation result of the treatment disease that other method possible to choose one of them. Neural network possible to use for forecast of the action the different development way of the treatment.

For forecasting we use feed forward neural network with four layers. The network was trained the back propagation algorithm.

The risk factors are the neural network inputs. The risk factors are different clinical, biochemical, behavioral and others features, pointing to raised probability to develop of the determinate disease. All directions of the preventive work are oriented on checking risk factor, and their correction in concrete person ore in populations as a whole.

The American Stroke Association has identified several factors that increase the risk of stroke. The more risk factors a person has, the greater the chance that he or she will have a stroke. Some of these you can't control, such as increasing age, family health history, race and gender. But you can change or treat most other risk factors to lower your risk. Factors resulting from lifestyle or environment can be modified with a healthcare provider's help.

Increasing age - The chance of having a stroke more than doubles for each decade of life after age 55. While stroke is common among the elderly, many people under 65 also have strokes.

Sex - The latest data show that, overall, the incidence and prevalence of stroke are about equal for men and women. However, at all ages, more women than men die of stroke.

Heredity (family history) and race - The chance of stroke is greater in people who have a family history of stroke. African Americans have a much higher risk of disability and death from a stroke than whites, in part because blacks

have a greater incidence of high blood pressure, a major stroke risk factor.

Prior stroke - The risk of stroke for someone who has already had one is many times that of a person who has not.

High blood pressure - High blood pressure is the most important risk factor for stroke. In fact, stroke risk varies directly with blood pressure. Many people believe the effective treatment of high blood pressure is a key reason for the accelerated decline in the death rates for stroke.

Cigarette smoking - In recent years, studies have shown cigarette smoking to be an important risk factor for stroke. The nicotine and carbon monoxide in cigarette smoke damage the cardiovascular system in many ways. The use of oral contraceptives combined with cigarette smoking greatly increases stroke risk.

Diabetes mellitus - Diabetes is an independent risk factor for stroke and is strongly correlated with high blood pressure. While diabetes is treatable, having it increases a person's risk of stroke. People with diabetes often also have high cholesterol and are overweight, increasing their risk even more.

Carotid artery disease - The carotid arteries in your neck supply blood to your brain. A carotid artery damaged by atherosclerosis (a fatty buildup of plaque in the artery wall) may become blocked by a blood clot, which may result in a stroke. If you have a diseased carotid artery, your healthcare provider may hear an abnormal sound in your neck, called a bruit (BROO ee), when listening with a stethoscope.

Heart disease - People with heart problems have more than twice the risk of stroke as those whose hearts work normally. Atrial fibrillation (the rapid, uncoordinated beating of the heart's upper chambers) in particular raises the risk for stroke. Heart attack is also the major cause of death among stroke survivors.

Transient ischemic attacks (TIAs) - TIAs are "mini strokes" that produce stroke-like symptoms but no lasting damage. They are strong predictors of stroke. A person who's had one or more TIAs is almost 10 times more likely to have a stroke than someone of the same age and sex who hasn't.

At present work we consider next risk factor of the development a stroke are considered following:

1. The Arterial hypertension.
2. The sugar diabetes.
3. Transitory ischemic attack.
4. Stenosis carotid artery.
5. Smoking.
6. Plaque destruction.

Thereby, as models shall use feed forward neural network (Fig. 1) with 6 entries. Herewith limit number of the layers, equal 4 (one - input, one - output, and two - hidden layer). The number neuron in each layer (and type functions) will be defined as a result of machine experiment on given training sample. The volume of sample is 250 patients. The data set for this samples were

got in JURS AMS by Gusaka, department vascular surgery. On output we get to recommendations, which can be such: the most further observation, treatment, recommendations for operation.

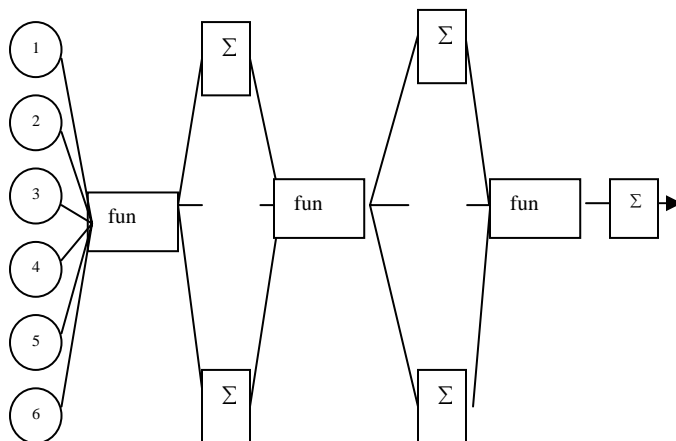


Fig. 1. Architecture neural network.

Conclusion

At present designed scientific bases to preventive maintenance stroke, there is big practical experience to realization this work, they are proved it high efficiency. Together with that, in our country of the factors to death-rate of the population from vascular diseases of the brain remain one of the most high in the world, there is trend even to their growing. This is explained by insufficient attention to work on warning stroke and chronic progressing vascular diseases of the brain. The purpose the work is a correcting the choice of the preventive measures, directed on prevention stroke.

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