

# NEURAL NETWORK FOR TESTING

**Bedřich Smetana**

Doctoral Degree Programme (2), FEEC BUT

E-mail: xsmeta06@stud.feec.vutbr.cz

Supervised by: Jan Chvalina

E-mail: chvalina@feec.vutbr.cz

**Abstract:** This article describes basics of neural networks, specifically aimed at usage of freeware to test freeware for creation simple neural network. Discussion focuses on the use of generally available programs and problems with use of freeware applications. Attention is devoted to a comparison of real and theoretical conditions connected with practical computer support.

**Keywords:** neural network, Matlab, Simbrain

## 1 INTRODUCTION

The beginning of the establishment of neural networks is considered to work Warren McCulloch and Walter Pitts of 1943, which created a very simple mathematical model of a neuron, which is the basic cell of the nervous system [1]. The numerical values of the parameter in this model were predominantly bipolar, i.e. from the set  $\{-1, 0, 1\}$ . They showed that the simplest types of neural networks can in principle compute any arithmetic or logic function.

Neuron activity can be described mathematically: Capturing signal and transmission in neurons, where is created potential  $P$ :

$$P = w_1 * x_1 + w_2 * x_2 + \dots + x_n * w_n$$

If the potential is sufficiently large, the neuron transmits a signal  $y$ :

$$y = 1, \text{ if } P > w_0, \text{ otherwise } y = 0.$$

The condition that  $P > w_0$  can be overridden by activating function  $f(P)$ . The entire activity of neurons can then enroll in one mathematical relationship where  $w_0$  is a negative number that represents the threshold that shall overcome potential.

Neural networks can be described by the process for neuronal connections, according to the topology, activation functions, ways of learning and their names are related to the history of development.

An interesting feature of neural networks is the ability to learn through repeating cycles. This capability is enabled by the teacher - by using prepared data series or network can teach itself [2].

One of the first applications using neural networks was the application for recognizing texts. From simple applications for recognition of single characters, there was developed the method of obtaining data from the full text databases - data mining. Other applications can be found in medicine, metallurgy, crack detection, economics, banking, but also in security services and the army. Areas of use of the army in support of the decision-making process, such as the image recognition is identifying areas of interest of the author.

These findings are useful in teaching the subject at the Applied Informatics in military five-year study at the Faculty of Military Leadership at the University of Defense, at the civilian branch in Informatics I, II. Also in learnings at other universities, like at the University of technology.

## 2 LICENSED PROGRAMS

One of readily available options for working with neural networks appear to use Matlab Simulink and Neural Network Toolbox. This toolbox enables the implementation of multiple network types and different algorithms learning network.

The Simulink block diagram created a system where you can set the basic parameters of the neural network. Own learning process takes place at the network level Matlab. The process of learning networks is realized by function to initialize the network (initff) simulation run networks (simuff) training network back propagation algorithm (trainbp).

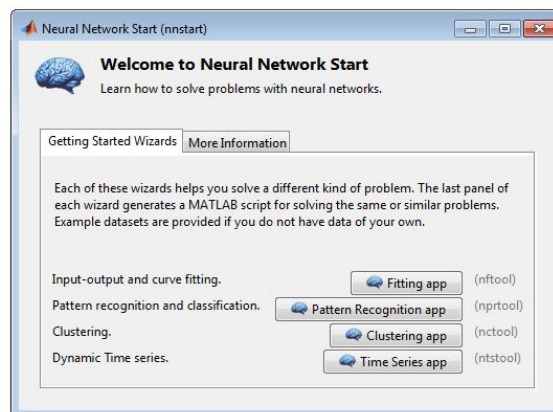
We can create a forward (feedforward) NN without feedback with use the command newff () with input variables:

- PR - indicates the range of input values (minimum and maximum) elements of input vectors.
- Layers - indicates the number of neurons in each layer. The number of layers is not limited. The most commonly used two layers.
- TransFcns - indicates transmission (activation) of neuronal function of each layer.
- BTF - specifies the training function of the network (beachtraining - batch learning).
- BLF - specifies lerning function network (steptraining).
- PF - specifies the function to calculate the error during training.[3]

View of part of the process to create a neural network reveals two basic findings:

- already creating a neural network requires knowledge of the commands and parameters
- knowledge of commands makes demands on users

Both modules are also available in the local network of the University of Defence. Despite price reductions for Education presents at the income level of the population and therefore students represents the price of the individual modules in the order of tens limiting factor utilization.

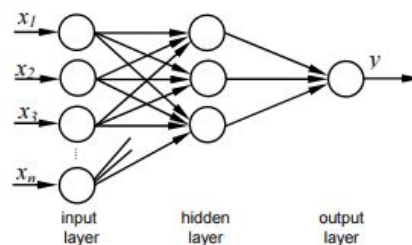


**Figure 1:** Sample environment for designing neural network in Matlab.

### 3 SOFTWARE FOR TEACHING SUPPORT

During the research applications of artificial intelligence on VŠB - Technical University of Ostrava was created a computer program NEURONEK that implements the learning phase, testing and equipping of three layers neural networks. Although the program has been developed mainly in the field of mathematical approximations relations, the requirement to obtain as much information about the suitability of using neural networks for solving problems led to the creation of a clear and universal computer applications, suitable also for use in the educational process. Neuronek is a computer program that provides learning phase, testing and equipping of three layers neural networks, which in the learning process uses the method of backpropagation. The number of neurons in input layer is equal to the number of the analyzed input is automatically set after reading data from the training set file. The output neuron is only one, and we can only watch one output value. In case of necessity of the multiple outputs, it is appropriate to use additional neural networks.

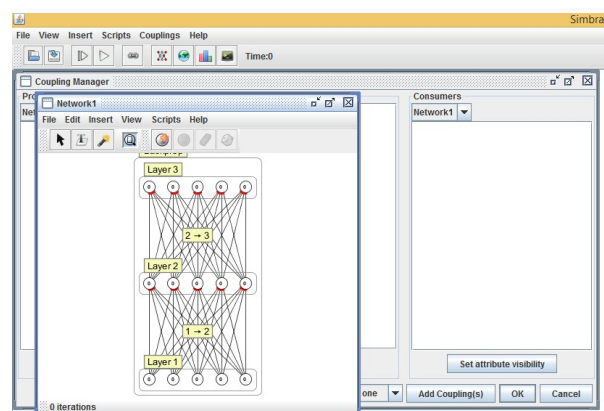
The advantage of the program compared to mightier instruments of MATLAB® environment it is its sheer simplicity of control buttons, availability partial data with subsequent elections calculation strategy, a much higher rate calculation, automatic adaptation of the network structure the content of the training data set, no programming and thus accessible to users without knowledge of the theory of neural networks [4].



**Figure 2:** Topology of artificial neural network.

### 4 FREWARE FOR CREATING AND TESTING NEURAL NETWORKS

To demonstrate the properties of freeware programs useful for testing and the creation of neural networks is an interesting program Simbrain. After downloading the compressed file, after unpacking



**Figure 3:** Formation neural network in Simbrain.

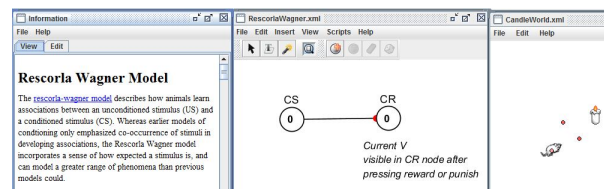
it and using the available web-based help and tutorial on You-tube there can be tested first steps.

The condition is either use of downloaded Java application launcher or to directly install Java. After unpacking the program there are about 50 megabytes and it is therefore easily transferable to stick. The program responded well to older versions of P4 PC with 512 MB RAM.

Simbrain program is graphically based with lots of tools and graphical environments - so-called workspaces. After opening the workspace it opens the neural network with the description and the possibility of modification and use.

In the formation neural network we can take advantage of inserting individual neurons and connections possibly insert a neural structure or the entire network and link them through couplings mode. The tool can be run from a flash drive.If you open the run file with the jar extension in a compression program, we can estimate the possibilities of use by its content.

Another option is to use tested neural in script form for testing or simulations or as inspiration for our own projects. One of the projects is stored Rescorla Wagner model for the study of animal reflexes, who was one of the sources of the theory of Pavlovian reflexes [5].



**Figure 4:** Illustration of neural network in Simbrain.

## 5 TIME LIMITED TESTING OPTIONS USING NEURAL NETWORKS

Neural networks are emerging in the tools of large software companies such as Google. Here are involved in services related to extractions of information databases, translation as well as identifying objects in photographs as Deep dream project that generated composition and fantastic creatures. The project subsequently led to the creation of applications Deepdreamer for similar purposes [6].



**Figure 5:** The Dog-Fish from Google Deep dream.

Another interesting project is an intelligent keyboard for mobile phones SwiftKey Keyboard. This

application is based on trained neural networks accelerating the use of text features suggesting alternative sentences.

## 6 CONCLUSION

Article reflects the experience of using software support when using demanding applications in less suitable conditions. He showed some possibilities of solving tasks of the research plan in terms of the University of Defence.

In Antonini film *Blow-Up* is an example of identifying an object from a photo. This identification is important nowadays, especially in applications in the military. Outside mathematical models for incomplete information systems, artificial neural networks, which can achieve the desired results. This is important at a time of tension in international relations, shooting down civilian aircraft when returning memories of the Cold War, when even a flock of migrating birds could unleash a nuclear apocalypse. If there is not overtrained neural network ...

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