

## Operations manual for software program LogNNet

1. Before starting the LogNNet.exe program, download the MNIST-10 base files from Yann LeCun's Internet page <http://yann.lecun.com/exdb/mnist/> and copy them to the local "Mnist" folder. As a result, four files should be available in the "Mnist" folder:  
t10k-images.idx3-ubyte  
t10k-labels.idx1-ubyte  
train-images.idx3-ubyte  
train-labels.idx1-ubyte  
If these files are missing, the program will display a warning message.
2. After starting the program, the dialog box of the program will appear (see Fig. S1). To start the program, press the "Start" button.  
The execution time of the program for 20 epochs and  $P = 25$  is about 5 minutes on a modern computer.
3. Before starting the algorithm, the following parameters can be changed: the number of epochs, the number of neurons of the hidden layer  $P$ , and the values of the parameters  $r$ ,  $A$ ,  $B$ . T-Pattern can be selected in the corresponding field from "T-Pattern-3", "T-Pattern-2" or "T-Pattern-1".
4. After execution, the program will display the following parameters: classification accuracy for Algorithms 1-3, the total execution time of the algorithms ( $All\_t$  in milliseconds), and the processing times for one image  $talg1$ ,  $talg2$ ,  $talg3$ .
5. If it is necessary to stop the training process before the end of the planned number of epochs, press the "Stop training" button.
6. To display individual elements of the MNIST-10 base in the "MNIST-10" field, press the "View training data" and "View testing data" buttons.
7. The main folder contains the following files: source files of the project LogNNet.dpr, Unit1.pas, Unit1.dfm for the Delphi 7 shell, and the "VMproect" folder with the "T-Pattern" template files.

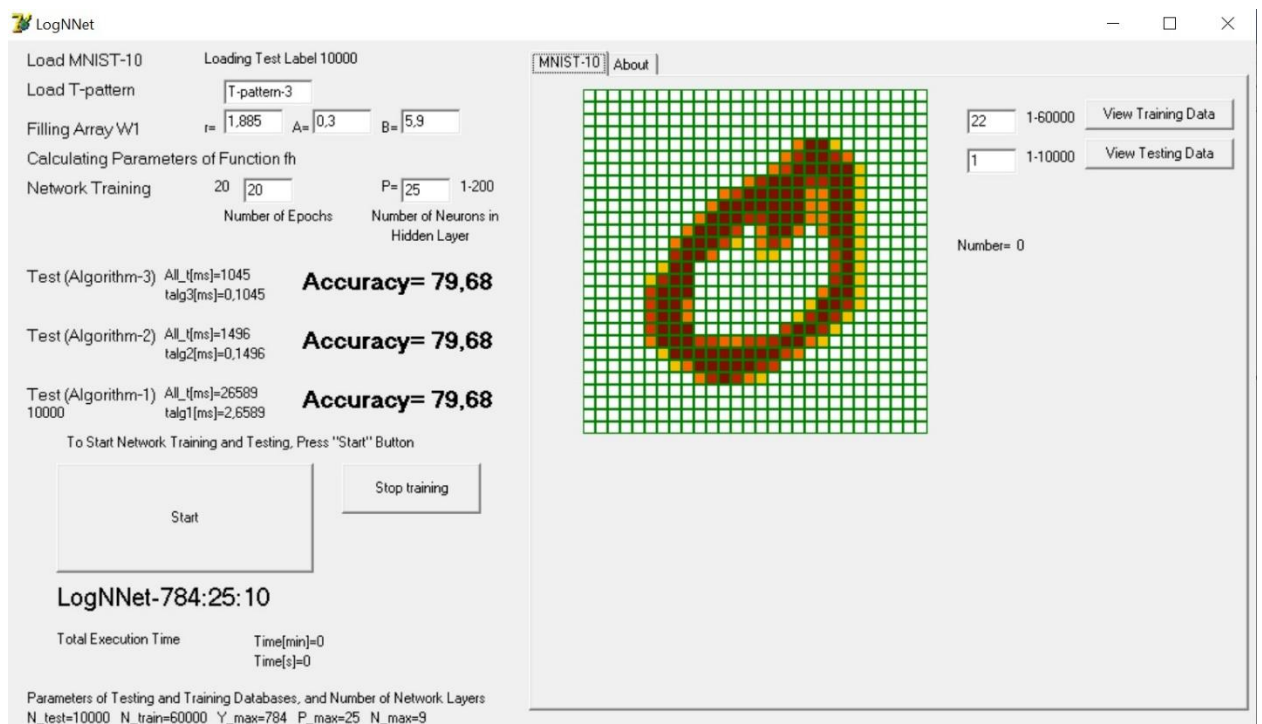


Figure S1 - Dialog box of the LogNNet.exe program