

I. IDENTIFICATION DATA

Thesis name:	Pattern recognition with neural networks
Author's name:	Regina Latypova
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Computer Science
Thesis reviewer:	Associate professor Makletsov Sergey Vladislavovich, Ph.D
Reviewer's department:	Kazan Federal University, N.I. Lobachevsky Institute of Mathematics and Mechanics, Department of Theory of Functions and Approximations

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	challenging
<i>Evaluation of thesis difficulty of assignment.</i>	
In the thesis, artificial feedforward neural networks for pattern recognition are considered. One of the most important issues of the neural network architecture is selecting an optimal activation function. Despite a large number of studies, an effective algorithm of searching for the optimal activation function is not still proposed. The aim of the thesis is to fill this gap, which specifies a difficulty of the thesis assignment that is to develop a method of selecting an optimal activation function from a given parametric family.	

Satisfaction of assignment	fulfilled
<i>Assess that handed thesis meets assignment. Present points of assignment that fell short or were extended. Try to assess importance, impact or cause of each shortcoming.</i>	
The author studies general aspects of neural networks, and explores the problem of the handwritten digits recognition using neural networks. The author develops and theoretically justifies a new analytical method for finding the optimal activation function in the parametric family under consideration. She also designs and develops a software package that implements this method. The results on performance evaluation of the proposed algorithm are also carried out. The thesis as a whole is performed at a high level, although some aspects are not properly discussed. Can this method be applied to another than the handwritten digits recognition problem? Was the CUDA technology used?	

Method of conception	correct
<i>Assess that student has chosen correct approach or solution methods.</i>	
Existing approaches to the solving the problem were analyzed. A mathematical method for the proposed model is comprehensively described and correct.	

Technical level	A - excellent.
<i>Assess level of thesis specialty, use of knowledge gained by study and by expert literature, use of sources and data gained by experience.</i>	
The author did a great research on neural networks and properly used her knowledge gained by it to complete the task.	

Formal and language level, scope of thesis	B - very good.
<i>Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.</i>	
The thesis is well arranged and organized. Some sentences are too long that hinders the perception of the information given in the text.	

Selection of sources, citation correctness	B - very good.
<i>Present your opinion to student's activity when obtaining and using study materials for thesis creation. Characterize selection of sources. Assess that student used all relevant sources. Verify that all used elements are correctly distinguished from own results and thoughts. Assess that citation ethics has not been breached and that all bibliographic citations are complete and in accordance with citation convention and standards.</i>	

Sources are selected properly and cited correctly. Some sources are not recent that is not good for machine learning as it is fast-changing field and there are a lot of studies publishing every year.

Additional commentary and evaluation

Present your opinion to achieved primary goals of thesis, e.g. level of theoretical results, level and functionality of technical or software conception, publication performance, experimental dexterity etc.

Judging by results, the task was completely solved. Performance evaluation of the proposed algorithm showed good results.

III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION

Summarize thesis aspects that swayed your final evaluation. Please present apt questions which student should answer during defense.

The thesis, in its content, corresponds to the chosen topic and tasks. However, some questions are remained open:

1. Can this method be applied to another than the handwritten digits recognition problem?
2. Was the CUDA technology used as it was indicated in assignment?

I evaluate handed thesis with classification grade **B - very good**.

Date: **24.5.2019**

Signature: