

Opinion

by Prof. Dr. Angela Slavova Popivanova

for the dissertation on the subject:

“An Application of Cellular Neural Networks for investigation of partial differential equations arising in financial mathematics”

with the author: Pavel Todorov Stoynov

for awarding the educational and scientific degree Doctor,

Field of higher education 4. Natural sciences, mathematics and informatics,
Professional division 4.5 Mathematics,

Doctoral program "Mathematical modeling and applications of mathematics"

By order No. 88/04.05.2022 of the Director of IMI-BAN, I have been appointed as a member of the jury for the defense of Pavel Todorov Stoynov's dissertation on the topic "Application of Cellular Neural Networks for investigation of partial differential equations arising in financial mathematics". On 13/05/2022, I received the defense materials electronically, which include:

1. Dissertation - in two files
2. Abstract
3. List of publications, as well as the publications themselves
4. Application for the defence
5. Applicant's contributions
6. Autobiography
7. Reference for citations.

On June 8, 2022, an extraordinary meeting of the jury was held in connection with the presence of plagiarism in the dissertation. It was established that Pavel Stoinov borrowed verbatim whole passages from the following 3 books, without citing them and without including them in the bibliography:

- R. Cont, P. Tankov, Financial Modelling with Jump Processes, CRC press Company, 2004
- S. Boyarchenko, S. Levendorskii, Non-Gaussian Merton-Black-Scholes Theory, World Scientific, 2002
- O. Ugur, An Introduction to Computational Finance, Imperial College Press, 2009

The jury unanimously decided that there is plagiarism in Pavel Todorov Stoynov's dissertation work.

In this regard, I will present a general description of the dissertation work and the publications presented on it.

General description of the presented materials

Pavel Stoinov has presented a dissertation in the volume of 156 pages, containing an introduction, three chapters, a conclusion, a bibliography, the author's publications on the dissertation, and appendices.

The dissertation is devoted to the application of non-linear Cellular Neural Networks (CNN) to the study of non-linear partial differential equations that arise in financial mathematics and in particular the Black-Scholes equation. The topic is extremely up-to-date from the point of view of financial markets and their dynamics. The concept of dynamic investment decisions or dynamic stocks is very important in economics and financial mathematics. The nonlinear Black-Scholes equation is too complex for analytical study, therefore, the application of CNN to its numerical study enables the creation of software products that would have important applications in risk management in financial markets.

Chapter 1 is entitled "Stochastic Processes, Stochastic Differential Equations". Much of it is borrowed text from the above-mentioned books without citing them.

Chapter 2, Cellular Neural Networks, presents the main types of cellular neural networks and the equations that describe them. Simulations of the ST distribution density plot for different cases of CNM are presented, which are author contributions. No plagiarism was found in this chapter.

Chapter 3 is entitled "Application of Cellular Neural Networks for Approximate Solving of Integro-Differential Equations from Financial Models and Partial Differential Equations in Financial Mathematics". MATLAB code is borrowed here from the following source without citation - O. Ugur, An Introduction to Computational Finance, Imperial College Press, 2009

Totally 6 publications have been presented on the dissertation work, of which 5 are in journals with SJR, and 1 is referenced in Zentralblatt fur Mathematik.

Unfortunately, due to the established plagiarism, no conclusion can be drawn about the scientific contributions of Pavel Stoinov in the dissertation and in the publications.

Conclusion: The presented dissertation is on an extremely up-to-date subject, such as financial mathematics and more specifically the numerical solution of some complex nonlinear partial differential equations by means of Cellular Neural Networks. In the review process, plagiarism of a significant part of the text of the dissertation was found, and with protocol No. 2 of a meeting of the scientific jury dated 06/08/2022, a decision was made on the procedure for the defense of a dissertation on the topic "Application of cellular-neural networks for investigation of partial differential equations arising in financial mathematics" with author Pavel Todorov Stoinov to be discontinued. In connection with the decision thus taken, I do not support the awarding of the educational and scientific degree "doctor" to Pavel Todorov Stoinov in the field of higher education 4. Natural sciences, mathematics and informatics, professional division 4.5 Mathematics, doctoral program "Mathematical modeling and application of mathematics".

Sofia, 6.07.2022

Signature:

A black rectangular redaction box covering the signature of the professor.

(Prof. D.Sci. Angela Slavova Popivanova)