

ATTITUDE

on dissertation work for the acquisition of educational and scientific degree "doctor"
in a professional field: 4.6 Informatics and Computer Science

Author of the thesis: Ivan Ivanov Blagoev

Thesis title:

METHODS AND MEANS OF DATA ANALYSIS IN INFORMATION SYSTEMS USING TIME SERIES

Member of the Scientific Jury:

Assoc. Prof. PhD Desislava Ivanova

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1. Relevance of the problem

The presented dissertation consists of 4 chapters, contributions, list of publications, declaration of originality and bibliography. The dissertation is in a total volume of 125 pages, 33 figures and 122 cited literature sources. The main goal of the dissertation is to develop new methods and tools for data analysis in information systems using time series through which to achieve better results in methods for forecasting financial instruments, big data processing and improving cryptography. and cybersecurity. *The scientific field is undoubtedly relevant.*

2. Degree of knowledge of the status of the problem and responsibility of the chosen research methodology and set goals and objectives

The first chapter reviews current topics in data science, especially when these data are presented as time series. The need to develop new methods and tools for data analysis in information systems using time series is motivated. *The second chapter* presents the developed methods for research and forecasting of financial time series using different mathematical devices. *The third chapter* describes the developed solutions for providing cryptographic protection in the provision of information services by studying random number generators, representing time series. The practical application of the proposed approaches for cybersecurity is presented. The real results of the conducted tests are shown, proving the successful solution of the set tasks. *In the fourth chapter* the overcoming of problems when working with big data sets and limited computer resources in time series research is done with the developed software approaches and with the means of programming language R. *In*

conclusion, a summary of the results is presented. Guidelines for future research and development have been identified. *Conclusion: Ivan Ivanov Blagoev shows a high level of knowledge in the scientific field, as the goals and tasks set in the dissertation fully correspond to the chosen research methodology.*

3. Contributions

The contributions in the dissertation can be divided into scientific and applied:

SCIENTIFIC:

1. A method entitled “MA Volatility Indicator” has been developed to combine indicators for detecting price movements with new approaches when using timelines of financial data.
2. The apparatus of artificial neural networks shall be applied for the purpose of examining financial timelines. An algorithm has been developed to train the neural network by increasing the size of the neural network input and creating a hybrid structure, and a model for self-build three-layer MLP has been proposed.
3. A method has been developed to increase cryptographic protection in information systems based on studies on the quality of random number generators.
4. Programming methods have been developed for efficient operation with big data with means in the R language.

APPLIED:

5. Experimental research has been carried out to solve cyber security problems in public widespread hosting services. The results obtained confirm the validity of the proposed method of enhancing cyber security.
6. The developed methods for increasing cryptographic protection are implemented in the technological infrastructure of IICT-BAS. A study of cryptographic tests and the quality of entropy on real-world busy server systems with public Internet services was conducted.

4. Dissertation publications

Ivan Ivanov Blagoev presented 9 publications related to the dissertation. All publications are presented at renowned scientific forums. Two of the publications are with SJR factor. In addition, citations of the dissertation's publications related to the dissertation are

presented. *The publications presented by Ivan Ivanov Blagoev fully cover the requirements for obtaining the educational and scientific degree „doctor“.*

5. Opinion and recommendations

The dissertation is written at a high level. The abstract contains the basic information and accurately and clearly reflects the contributions to the dissertation.

Questions:

- ✓ Could you present the comparative data showing the advantages of the proposed method "MA Volatility Indicator" over existing methods for the purpose in this scientific field? What are the advantages of applying the proposed method with respect to big data analytics of financial data?

6. Conclusion

The presented dissertation corresponds to the set of criteria and indicators for acquiring the educational and scientific degree "Doctor", according to the Law for development of the academic staff in the Republic of Bulgaria (ZRASRB), the Rules of BAS for scientific degrees and for holding academic positions at IICT-BAS.

I strongly recommend to the scientific jury to award Ivan Ivanov Blagoev the educational and scientific degree "Doctor" in the professional field 4.6 Informatics and Computer Science.

Date: 28.06.2021
Sofia, Bulgaria

JURI MEMBER:

Assoc. Prof. PhD Desislava Ivanova

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