

## OPINION

from professor Radoslav Dakov Yoshinov, PhD  
regarding a dissertation for the award of the educational and scientific degree "doctor" in the  
scientific field 4. Natural Sciences, Mathematics and Informatics, professional field 4.6.  
Informatics and Computer Science, doctoral program Informatics

Author of the dissertation: Edjola Kristaq Naka

Scientific advisor: Prof. Dr. Vasil Gulyashki

Thesis topic „**Optimization Algorithms for Data Management**”

According to the Order of the Director of IICT-BAS No. 277/06.11.2024, I have been appointed as a member of the scientific jury for the procedure for the acquisition of the educational and scientific degree "doctor" of Edjola Kristaq Naka. At the first meeting of the scientific jury, held on 08.11.2024, I was selected to prepare a statement on the procedure, and I have received all the necessary documents.

When forming the final grade of the dissertation, the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (LDASPB), the Regulations for its implementation, as well as the Regulations on the specific conditions for acquiring scientific degrees and for occupying academic positions at Institute of Information and Communication Technologies – BAS were taken into account.

### **Relevance of the dissertation research**

The management, storage, processing, and confidentiality of big data raise questions related to the correct understanding and analysis of this data. The proper interpretation of data is of particular importance for making the right decisions. All this determines the conduct of scientific research to find effective optimization algorithms for data processing and management. In this regard, the use of machine learning techniques for the purposes of Parkinson's prediction is an actual research direction.

### **Degree of knowledge of the research problem**

Based on the results published on the topic of the dissertation research, as well as the review and bibliographic reference of 287 sources, it can be established that the doctoral student is well aware of the nature of the researched issue.

## **Analytical characteristic**

The dissertation work of Edjola Kristaq Naka submitted to me for review contains a total of 165 pages, following the following structure: introduction, 3 chapters, conclusion - summary of the results obtained, contributions, list of publications on the topic of the dissertation research, noted citations of the publications, declaration of originality of the results and bibliography, as well as lists of tables and figures. The aim of the dissertation work is presented on page 52 and 7 tasks are set for its implementation.

**Chapter 1** provides an overview and analysis of the methods and algorithms used for optimization in various key areas of data management, focusing on the problem of feature selection. The concepts of metaheuristic optimization algorithms and their application in feature and function selection for machine learning classifiers are presented. It has been shown that improving metaheuristics and developing hybrid metaheuristics, as well as their combination with other feature selection techniques, lead to improved prediction of Parkinson's disease.

**Chapter 2** describes new metaheuristic algorithms, methods, and improvements that are used for the first time in feature selection for Parkinson's disease prediction. The volleyball Premier League algorithm is used as the main metaheuristic algorithm of the proposed metaheuristic algorithms. Since this algorithm has not been used for feature selection, an appropriate modification and adaptation is proposed.

**Chapter 3** describes the results obtained as a consequence of the numerical experiments conducted with the proposed algorithms, methods, and improvements described in Chapter 2.

### **Degree of personal involvement of the doctoral student**

The personal participation of the doctoral student is judged by the publication activity, reflected in the articles published on the dissertation. The doctoral student convincingly presents the presented results, with very good and thorough argumentation. It should also be noted that the nature of the research implies very good and broad preparation in the field of the research problem.

### **Compliance of the abstract with the requirements for its preparation and adequacy of coverage of the main points and contributions**

The presented abstract in a volume of 56 pages faithfully reflects the essence and content of the dissertation work, including the goal and objectives of the dissertation research, the methods for their implementation and complies with the requirements of the LDASPB and the Regulations for its implementation.



### **Evaluation of research publications**

The presented list of publications on dissertation work includes a total of 7 publications, 1 of which is in an IF edition, and the rest are in editions referenced and indexed in world-renowned databases of scientific information (AMC, Scopus, Web of Science, IEEE). The doctoral student has 4 independent publications, and in the rest she is the first author. Thus, the presented publications on the research topic correspond to 96 points, which significantly exceeds the minimum of 30 points for acquiring the educational and scientific degree "Doctor" according to the minimum national requirements and the specific requirements of IICT-BAS.

### **Contributions of the doctoral student**

The contributions formulated by the doctoral student could be considered as scientific and applied contributions that lead to the enrichment of existing knowledge.

### **Critical remarks and recommendations**

I have no critical remarks. I recommend that Mag. Edjola Kristaq Naka continue his research in this important area for society, making his other results public as well.

### **Conclusion**

A significant amount of scientific research has been carried out, the results of which convincingly show that Edjola Naka possesses the necessary knowledge and skills in the field of informatics and computer sciences. The author's personal participation in the development, as well as the ability for independent scientific research, is undeniable. The content and contributions of Edjola Kristaq Naka's dissertation work comply with the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its implementation, as well as the Regulations on the Specific Conditions for Acquiring Scientific Degrees and for Holding Academic Positions at the Institute of Information and Communication Technologies – BAS. **All this gives me reason to confidently give a positive assessment of the presented dissertation work and I propose to the esteemed Scientific Jury to award Edjola Kristaq Naka the educational and scientific degree of "Doctor" in the doctoral program "Informatics", professional field "Informatics and Computer Sciences".**

06 January 2025

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