

OPINION

on the dissertation of Petar Rosenov Petrov on the topic "Modeling of processes for big data analysis through generalized networks" for awarding the educational and scientific degree "PhD", Field of higher education 5. Technical sciences, Professional direction 5.3. "Communication and computer technology"

According to the Order of the Rector of the University "Prof. Dr. Asen Zlatarov", Burgas, No. UD-290/24.07.2025, I have been appointed as a member of the Scientific Jury in the procedure for the defense of a dissertation for the award of the educational and scientific degree "PhD" in the doctoral program "Computer Systems and Technologies", Field of higher education 5. Technical sciences, Professional direction 5.3. Communication and computer technology on the topic "Modeling of processes for analysis of big data through generalized networks" by the part-time doctoral student Petar Petrov.

Brief biographical data about the doctoral student

Petar Petrov was born on 11.03.1996. In 2015, he obtained a master's degree in Software Technologies at the University "Prof. Dr. Asen Zlatarov" in Burgas. In the period 2022-2024, he obtained the professional qualification "Teacher of Mathematics and Informatics" and "Teacher of Vocational Training" in the field of Artificial Intelligence at TU-Varna. He was a teacher and deputy director at a school in Burgas, is the author of textbooks and teaching aids in computer modeling and information technologies, is a co-author of curricula for the professions: programmer, system programmer, applied programmer, robot programmer, artificial intelligence programmer. Since 2021, he has been a part-time doctoral student at the Department of Computer Science and Technology of the University "Prof. Dr. Assen Zlatarov" in Burgas.

Dissertation on the topic "Modeling of processes for big data analysis using generalized networks"

The dissertation is dedicated to the development and description of generalized network models of processes related to big data analysis, using intuitionistic fuzzy sets and indexed matrices. Based on this approach, combined with algorithms for cluster analysis, classification and optimization, a framework for data analysis under uncertainty is proposed. In order to achieve this goal, 5 tasks were set, which were ultimately completed.

The contributions of the dissertation are summarized as follows:

1. Applications of intuitionistic fuzzy estimates are proposed: in the process of waste sorting; for analyzing the frequency of user requests; when applying the support vector method for recognizing scientific terms and determining keywords; for analysis of data on student academic achievement; for analysis of data from State Matura exams;
2. Generalized network models have been developed for: the algorithm Spatial Cluster Analysis based on Density of Applications with Noise (DBSCAN) and its applications on a data set related to diabetes; the method for balanced iterative reduction and clustering with hierarchies (BIRCH) with intuitionistic fuzzy estimates;

3. Algorithms for solving the knapsack problem have been developed, based on circular and elliptical intuitionistic fuzzy sets.

I define the contributions as "Scientific-applied" and "Applied".

Publications related to the dissertation

The attached reference shows that Petar Petrov is the author of 10 publications related to his dissertation work, eight of which are in specialized Springer series with SJR-factor, one in an open access journal, one in a Proceeding of an international conference in our country. These publications are representative and meet the requirements of the Regulations on the conditions and procedure for acquiring scientific degrees at the University "Prof. Dr. Assen Zlatarov" - Burgas. Petar Petrov has provided data for 3 citations, for 3 of his articles.

Critical notes and recommendations

It would be good if the candidate had indicated his intentions for future research. I am convinced that he is clear in this regard and I expect him to share them during the defense. Here are some specific notes:

- The data for schools is for only one academic year and the algorithm works with them. What will the algorithm look like if data for more years is given to it? Is the proposed approach applicable to data of the order of, for example, terabytes/petabytes?;
- The program implementation of some of the algorithms and models has been tested with synthetically generated data sets. I recommend that this be done with real data in the future;
- Some of the software implementations have not been described in details.

Conclusion

The above is a reason to give a positive assessment of the dissertation work and the materials to it and to recommend to the esteemed members of the Scientific Jury to vote for awarding Petar Rosenov Petrov the educational and scientific degree "PhD" in professional field 5.3. "Communication and Computer Engineering".

25.09.2025

Jury member:

(Corresponding Member of BAS, Prof. DSci. Stefan Hadjitodorov,
Section "Bioinformatics and Mathematical Modeling", IBFBME-BAS)

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