

STATEMENT OF OPINION

by Assoc. Prof. Deyan Georgiev Mavrov, PhD,
Burgas State University „Prof. Dr. Asen Zlatarov“,
on the dissertation titled

“*Modelling of Processes for Big Data Analysis Using Generalized Nets*”,
submitted for reception of the educational and scientific degree of “Doctor”
as part of the “Computer Systems and Technologies” doctoral programme,
professional field 5.3. “Communication and Computer Technology”

Doctoral candidate: **Petar Rosenov Petrov**

Scientific supervisors: **Acad. Krassimir T. Atanasov, DMSc, DTSc**

Assoc. Prof. Vesselina K. Bureva, PhD

1. General information

As a member of the scientific jury, appointed through order No. 290 / 24.07.2025 from the rector of the BSU “Prof Dr. Asen Zlatarov” I have received the following items, which were provided by the doctoral student:

- a summary of the dissertation,
- a curriculum vitae,
- a report on the fulfillment of the minimal scientific metrics,
- the full text of the dissertation,
- copies of the articles published during the candidate’s studies.

After reviewing the information provided in the submitted documents, I have concluded that the candidate has completed the technical part of the requirements, as listed in Article 43, Section 3 and Appendix No. 1 of the Rules for the Acquisition of Scientific Titles and the Appointment to Academic Positions in the BSU “Prof Dr. Asen Zlatarov”. Of the 10 included articles eight are indexed in Scopus’ database, two are published in unindexed periodicals, and two are indexed in Web of Science as well. The calculated 126,65 points are more than enough to exceed the minimum of 30 points.

The candidate was awarded an degree of Bachelor with the specialty of “Software and Industrial Design” by the Univesity of Plovdiv “Paisii Hilendarski” and a degree of Master with the specialty of “Software Technologies” by the BSU “Prof Dr. Asen Zlatarov”. After that he acquired qualifications as a teacher and worked for a long time in the school system. He also has experience as a freelance programmer and as a trainer in a software academy.

2. Topic of the dissertation

As the title would suggest, the candidate has constructed generalized net models of algorithms that are used to analysis and clusterize arrays of data. An intuitionistic fuzzy evaluation of the result has been added to these algorithms. The clusterization algorithms are applied over real and synthetic data.

The candidate has developed algorithms for the analysis and success rate of schools and the results of the State Maturity Exams, which rely on intuitionistic fuzzy evaluations. The second algorithm utilizes clusterization to separate the schools in groups based on their average marks in the SME.

Additionally, the candidate with his co-authors has applied intuitionistic fuzzy logic and index matrices to the solution of several different variations of the knapsack problem. This is the first time this problem has been expressed using these mathematical tools and the first time a variant of it has been implemented with intuitionistic fuzzy evaluations.

Also given is a reduced scale example of item sorting using robots, based on their characteristics, which utilizes intuitionistic fuzzy evaluations. The proposed principle can be extended for the purpose of waste separation.

The dissertation also presents a design of a system, which uses support vector machines to recognize terms in a text, which have been classified as “scientific”.

While the author has worked on separate topics, each going in its own direction, they are connected by a common goal to discover relations in unordered/unseparated data. The different parts of the dissertation give a good perspective on the varying ways in which intuitionistic fuzzy logic can be applied in data evaluation. These ideas can contribute to future applications in practice of the mathematical instruments used in this work.

3. Contributions by the candidate

The candidate’s scientific contributions consist of the following:

- development of algorithms for the analysis of educational system results, utilizing intuitionistic fuzzy logic and clusterization,
- development of algorithms for the solution of several variants of the knapsack problem with intuitionistic fuzzy logic and index matrices,
- development of a method for waste separation using intuitionistic fuzzy evaluations.

His applied scientific contributions include:

- creating generalized net models of the DBSCAN and BIRCH clusterization algorithms with intuitionistic fuzzy evaluations,
- applying support vector machines for the recognition of scientific terms and the suggestion of teaching resources.

During the research process for this dissertation the candidate has developed several programs for solving variants of the knapsack problem; programs for the application of clusterization algorithms; a system for analyzing items using robots and a conveyor belt, two

web-based systems for the analysis of educational system results and a system for classification and recognition of scientific terms in a text.

4. Remarks

In my opinion the citations could have been ordered in a better way by following the order of their first mention in the text. The candidate has prepared a list of the papers that were used to compose the dissertation, but the numbering from this list was not used in the main text, and the papers in it have instead been duplicated in the long citation list, which also includes external citations. Also, the chapters which are based on the candidate's papers have not been labeled with the number of the paper they take their contents from. All this makes following the sources in the text cumbersome.

The text is well ordered and follows the author's logic, but perhaps it would have been better if the theoretical descriptions of the methods proposed by the candidate were directly followed by the description of their practical application, instead of being split in their own separate chapter. This way the information would have been less separated apart. A new operation with index matrices proposed by the candidate is included with the theoretical description, and it would have fit better if it was highlighted in the part of the text where it is applied in its respective algorithm.

The text contains several repetitions of information, which likely stem from the fact that it was repeated in the separate articles that correspond to the respective parts of the text – they could have been avoided. There are some minor technical errors in the text as well.

5. Conclusion

Having in mind all that was said so far, I consider that with his work on the dissertation titled "Modelling of Processes for Big Data Analysis Using Generalized Nets" the candidate Petar Rosenov Petrov has completed the tasks set forth by his supervisors and I propose to the esteemed scientific jury to award him with the educational and scientific degree of **"Doctor"** in the higher education field **No. 5. „Technical Sciences“**, professional area **No. 5.3. „Communication and computer technology“**, with the scientific specialty of **"Computer Systems and Technologies"**.

Burgas,
07.10.2025.

Signed:

Подпис задължен
Чл.2 от ЗЗЛД
(Assoc. Prof. D.G. Mavrov)