OPINION

by **Prof. Evdokia Nikolaeva Sotirova, PhD,**
Burgas State University „Prof. Dr. Asen Zlatarov"
of a dissertation thesis for awarding the educational and scientific degree of „Doctor"
in the field of higher education: 4. Natural Sciences, Mathematics and Informatics,
Professional field 4.6. „Informatics and Computer Science",
Doctoral Programme 01.01.12. „Informatics"

PhD student: **Danail Dichev Stratiev**

Topic: **Modeling of oil refining processes using generalized nets and intercriteria analysis**

Scientific supervisors: **Acad. Krassimir Atanassov, DSc, DSc**
Acad. Konstantin Hadzhiivanov, DSc

1. General presentation of the procedure and PhD student

The opinion has been prepared on the basis of Order No. RD-925 / 21.11.2025 issued by the Director of the Institute of Biophysics and Biomedical Engineering (IBPhBME) of the Bulgarian Academy of Sciences, Prof. Tanya Pencheva, concerning the composition of the scientific jury in the procedure for the public defense of a dissertation thesis entitled „Modeling of oil refining processes using generalized nets and intercriteria analysis", authored by Danail Dichev Stratiev, for awarding the educational and scientific degree „Doctor" in the field of higher education 4. Natural Sciences, Mathematics and Informatics, Professional field 4.6. Informatics and Computer Science, Doctoral Programme 01.01.12. „Informatics".

The materials presented by Danail Dichev Stratiev are in accordance with the Regulations for the Implementation of the Act on the Development of the Academic Staff in the Republic of Bulgaria at IBPhBME-BAS.

The dissertation thesis was discussed and admitted to defense at an extended scientific seminar of the "Bioinformatics and Mathematical Modelling" Section at IBPhBME-BAS, held on 14.11.2025.

Danail Dichev Stratiev was born on 06.09.1992. On 1 July 2021, he was enrolled as a doctoral student in the Doctoral Programme „Informatics" at IBPhBME-BAS. At an extended scientific seminar of the „Bioinformatics and Mathematical Modelling" Section, he was deregistered with the right to defend his dissertation thesis (Protokol No. 16/14.11.2025).

2. General assessment of the dissertation research

Actuality of the topic

Taking into account the increasingly growing requirements for efficiency, environmental compliance, and economic optimization in the oil refining industry, I consider the topic of the

dissertation thesis to be highly relevant. The processes in modern oil refineries are complex, run in parallel, and are characterized by numerous constraints and dynamic interdependencies, which necessitates the use of adequate mathematical and computational models. The application of generalized nets and intercriteria analysis corresponds to contemporary scientific trends in modeling and decision support for complex industrial systems.

Knowing the problem

The author demonstrates very good knowledge of the research problem, accurately identifies the limitations of traditional modeling approaches, and convincingly argues the necessity of using generalized nets as an adequate tool for the description, analysis, and simulation of such systems. The analysis of existing scientific studies and practices shows a very good understanding of the current state of the problem and logically justifies the choice of the applied methodological framework.

Research methodology

The methodology applied by the doctoral candidate is adequate and appropriate for achieving the stated objectives and research tasks. It includes a systematic literature review, formalization and modeling of complex, parallel-running processes using the apparatus of generalized nets, and the application of intercriteria analysis for the evaluation and selection of crude oil feedstocks. The combined approach enables both a detailed description and simulation of technological processes in an oil refinery and effective support for well-grounded managerial decision-making, thus providing the research with both scientific and practical value.

Characterization and evaluation of the dissertation thesis

The dissertation thesis of Danail Dichev Stratiev has a total volume of 151 pages. It consists of an introduction, six chapters, a conclusion, a list of abbreviations and symbols, a declaration of originality of the results, a bibliography, a list of the author's publications related to the dissertation, and a list of citations. The bibliography includes 239 references, all published in Latin script.

The dissertation thesis is well structured and complies with established academic standards. The individual chapters are clearly delineated and logically build upon one another in accordance with the stated research objective and formulated tasks. The presentation is clear and well argued, demonstrating very good command of the conceptual and terminological framework, as well as the ability to analyze and synthesize complex scientific information. The theoretical part provides a solid foundation for the development of the applied models, while the practical orientation of the dissertation contributes to its scientific and scientific-applied value.

The stated objective and research tasks have been successfully achieved. The obtained results are convincing and are presented at both scientific and practical levels.

3. Assessment of the publications and personal contribution of the PhD student

The results of the dissertation research are presented in eight scientific publications, four of which have been published in the journal Mathematics (Web of Science, Q1 quartile) with an impact factor ([2], [3], [4], and [5]). Publication [1] has been published in a Springer volume of the series Lecture Notes in Networks and Systems, indexed in Scopus (Q4 quartile, SJR), while publication [6] has been presented at an international scientific conference held in Burgas. Two publications have been accepted for publication: publication [7] in Lecture Notes in Networks and

Systems (Scopus, Q4 quartile) and publication [8] in the journal Comptes rendus de l'Académie bulgare des Sciences.

In seven of the publications, the doctoral candidate is the first author, which clearly demonstrates his leading personal contribution to the conducted research. The publications are entirely related to the topic of the dissertation thesis and consistently reflect the main results and scientific contributions of the study. The submitted reference report documenting 10 citations testifies to the scientific visibility of the research and to the interest in its results within the specialized scientific community.

Based on the presented publications and citations, Danail Dichev Stratiev fully meets the national minimum requirements, as well as the requirements of the Regulations for the Implementation of the Act on the Development of the Academic Staff in the Republic of Bulgaria as applied at IBPhBME-BAS.

4. Contributions and significance of the development

I agree with the scientific and scientific-applied contributions summarized on page 128 of the dissertation thesis. The obtained results are original and represent a significant contribution to the field of modeling complex, parallel-running processes using the apparatus of generalized nets. For the first time, a comprehensive generalized-net model of the processes in a modern oil refinery has been developed, encompassing the production of all major petroleum products and their interrelationships within a unified technological system.

The scientific-applied significance of the research is expressed through the combined use of generalized nets and intercriteria analysis as a tool for supporting managerial decision-making related to the selection of crude oil feedstocks and the optimization of production processes. The developed models create prerequisites for improving the economic efficiency and environmental sustainability of oil refining enterprises, which gives the dissertation thesis a clearly expressed practical orientation and significance for both the scientific community and industrial practice.

5. Abstract of dissertation thesis

The abstract is 85 pages long, well structured, and accurately and fully reflects the content of the dissertation thesis, the obtained results, and the conclusions drawn from the conducted research. It clearly presents the aim, the research tasks, the applied methodology, as well as the main scientific and scientific-applied contributions of the study. The presentation is clear and systematic and provides an objective view of the nature, scope, and significance of the dissertation thesis.

6. Critical remarks and questions

I have no critical remarks regarding the doctoral candidate.

In some places, the presentation could be further illustrated with more detailed quantitative comparisons or sensitivity analyses of the developed models with respect to changes in the input parameters, which would further enhance the applied value of the results. These remarks do not call into question the scientific and scientific-applied contributions of the dissertation thesis and are rather of a recommendatory nature.

7. Conclusion

My overall evaluation of the dissertation thesis, the abstract, the publications, and the scientific activity of Danail Dichev Stratiev is entirely positive. The dissertation thesis contains scientific and scientific-applied results that represent an original contribution to science and demonstrate that the doctoral candidate possesses solid theoretical training, the ability for critical analysis, and the capacity to conduct independent scientific research. No evidence of plagiarism has been identified.

The dissertation thesis fully complies with the requirements of the Act on the Development of the Academic Staff in the Republic of Bulgaria, its implementing regulations, as well as the Regulations for the Implementation of the Act on the Development of the Academic Staff in the Republic of Bulgaria as applied at IBPhBME-BAS.

This provides me with sufficient grounds to confidently recommend to the esteemed members of the Scientific Jury that Danail Dichev Stratiev be awarded the educational and scientific degree „Doctor" in Professional field 4.6. Informatics and Computer Science, Doctoral Programme 01.01.12. „Informatics".

28.01.2026
Burgas

Prepared the opinion:....
(Prof. Evdokia Sotirova, PhD)