OPINION

on the dissertation
for the acquisition of the educational and scientific degree "Doctor" (Ph. D.)

with author
Danail Dichev Stratiev

Thesis Topic:
"Modeling of oil refining processes using generalized nets and intercriteria analysis."

Professional field:
4.6 Informatics and Computer Sciences,
Doctoral Programme "Informatics"

prepared by
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1. General remarks on the procedure and the doctoral student

Danail Dichev Stratiev was born in 1992. He received his master's degree in 2017. In July 2021, he was enrolled as a full-time doctoral student in the doctoral programme "Informatics" with scientific advisors: Acad. Krassimir Atanassov and Acad. Konstantin Hadjiivanov (IGIC-BAS). He was discharged with the right to defend, effective from 01.07.2024. Based on the decision of the Scientific Council No. 16/14.11.2025, by Order of the Director No. 925/21.11.2025, the scientific jury for the procedure was appointed. The documents submitted by the doctoral student during the procedure comply with the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Internal Regulations for its application, as well as the Regulations for the terms and conditions for acquiring scientific degrees and occupying academic positions at the IBPhBME – BAS.

2. Evaluation of the thesis

The dissertation is 151 pages long, consists of an Introduction, Six Chapters (the first of which is a Literature Review), Declaration of Originality, Conclusion-summary of the obtained results and Bibliography of 239 sources. Lists of the doctoral student's publications on the dissertation, as well as found citations, are also presented. The introduction formulates the goals, namely "...to study the modeling of the production processes of all petroleum products in a modern oil refinery using generalized nets and selection of the crude oil using inter-criteria analysis"

Chapter 1 is essentially a literature review and presents a significant portion of the publications on generalized nets, as well as Petri nets used for modeling processes in oil refineries.

Chapters 2 to 4 present various GN models for products produced in an oil refinery – gasoline, diesel fuels, gas products and polypropylene. Chapter 5 is dedicated to a model describing the production of heavy petroleum products using generalized nets. Chapter 6 is a general model of the processes in a modern oil refinery, and with the help of intercriteria analysis, a ranking of the most suitable types of crude oils for processing in the refinery is achieved.

The value of the results obtained and the contributions formulated is undeniable, but their description in the dissertation is not always adequate.

3. Scientometric indicators

As scientific works with results on the dissertation, the doctoral student has presented 3 reports at international conferences and 5 articles with impact factor, four of them in the journal Mathematics, MDPI, Q1 and 1 in Comptes rendus de l'Académie bulgare des Sciences. In seven of the publications, Danail Stratiev is the first author. The candidate has also presented 11 noted citations of these publications. All this testifies to the high quality of the conducted research.

4. Correspondence of the abstract with the dissertation

The abstracts of the PhD thesis in Bulgarian and English accurately reflect the content of the dissertation in a condensed form.

5. Recommendations, critical notes and questions

The literature review is chaotically written and represents a rather unnecessarily extensive analysis of the publication activity related to the concept of a generalized network in various fields, rather than focused study of the various tools for modeling processes in non-petroleum processing and justification of generalized nets as the most appropriate means to fulfill the goal of the dissertation.

The cited literature is presented with heterogeneous bibliographic records and does not conform to a single standard, nor does it respect the order of occurrence in the text - source [77] is cited before [76], for example.

Like Leonhard Euler, who had a habit of suddenly switching from German to Latin in his letters, the doctoral student uses alternately a period and a comma as a decimal separator.

Other technical notes:

The doctoral student did not always find the correct Bulgarian equivalent of the terms used in the articles published in English:

- Some of the figures are not of good enough resolution, which instead of facilitating the visualization of the results, does not allow their investigation.
- Some abbreviations are introduced repeatedly (for Petri nets, two such are used)
- In several of the presented models there are technical inaccuracies.

On several occasions, the doctoral student claims that "... these processes are complex and parallel, and their modeling using GN allows one to avoid the shortcomings of linear and even dynamic programming (where the difficulty comes from the inability to reflect the logic

of cause-and-effect relationships)." In such a case, the following question is quite natural: If it is truly impossible to reflect the logic of cause-and-effect relationships, how exactly is modeling with generalized nets carried out, given the fact that in order to establish whether the transition predicates are satisfied, a logical assessment of their truthfulness is necessary?

Conclusion with a clear positive or negative evaluation of the dissertation work

The noted critical remarks regarding the design of the dissertation and the presentation of the main contributions of the dissertation cannot belittle the high scientific value of the conducted scientific research, and therefore, I positively evaluate the scientific and applied results achieved in the PhD thesis of Eng. Danail Dichev Stratiev positively.

The results obtained, as well as the scientometric indicators that support them, significantly exceed the requirements of the Act on the Development of the Academic Staff in the Republic of Bulgaria (ADSRB), the Regulations for the Implementation of the ADASRB, the Regulations for the Implementation of the ADASRB at the Institute of Biomedical Engineering and Biomedical Engineering - BAS. In view of the above, I propose to the esteemed scientific jury to award the educational and scientific degree "Ph.D." to Master of Science (Eng.) Danail Dichev Stratiev in the professional field 4.6 Informatics and Computer Science, doctoral programme "Informatics".

13.02.2026 .....
Sofia /Assoc. Prof. Peter Vassilev, PhD/