OPINION

from assoc. prof. Simeon Aleksandrov Ribagin, PhD
Institute of Biophysics and Biomedical Engineering – Bulgarian Academy of Sciences
Member of the Scientific committee, appointed by Order No. 231/24.03.2026 of the Director of the Institute of Biophysics and Biomedical Engineering – Bulgarian Academy of Sciences

Regarding: dissertation work of MSc Angel Ivanov Dimitriev, part-time PhD student at the "Bioinformatics and Mathematical Modelling" Department of the Institute of Biophysics and Biomedical Engineering (IBPhBME), Bulgarian Academy of Sciences (BAS), submitted for obtaining of the educational and scientific degree "Doctor" in the professional field 4.6 "Informatics and Computer Science", PhD program 01.01.12 "Informatics". Dissertation Title: "Software Product for the Implementation of Generalized Net Models and Its Applications"

Scientific consultants: Acad. Krasimir Atanasov, DSc and Assoc. Prof. Nora Angelova, PhD

Information on the Submitted Documents

The PhD candidate Angel Ivanov Dimitriev has submitted a dissertation, abstracts in Bulgarian and English, a list of publications on which the dissertation is based, a list of participations in national and international scientific forums, and all required documents in accordance with the regulations of IBPhBME – BAS for acquiring academic degrees and holding academic positions.

Information on the Dissertation

The dissertation submitted for evaluation was approved for defense at an extended scientific seminar of the "Bioinformatics and Mathematical Modelling" Section at IBPhBME – BAS on 06.03.2026. It addresses a significant scientific and applied problem related to the development and practical application of Generalized Nets (GNs) as a tool for modeling and simulation of complex processes.

Generalized Nets represent a powerful mathematical apparatus widely applied in areas such as industrial production, computer systems, and artificial intelligence. With the increasing complexity of models and the need for efficient handling of parallel processes, the demand for modern software solutions supporting their construction, visualization, and analysis is growing. In this context, the development of web-based tools enabling online work further enhances the relevance of the topic.

The main objective of the dissertation is the development of a software, namely OnlineGN — a web-based simulator that integrates the theoretical foundations of Generalized Nets with modern web technologies. To achieve this goal, nine well-justified research tasks have been formulated and successfully implemented.
The dissertation is structured in accordance with academic requirements and includes an introduction, four chapters, and a conclusion. It has 181 pages and the results are well presented in 81 figures.

The extended overview of the theoretical foundations and existing software tools for GN simulation presented in Chapter 1 demonstrates the author's deep knowledge of the field. These observations form the basis for the development of OnlineGN as a web-based, integrated, and platform-independent environment that combines modeling, visualization, editing, and simulation within a unified workflow.

Chapter 2 is devoted to the development of new algorithms for automatic visualization of Generalized Nets and for transforming SVG representations into TeX format, which constitutes a significant scientific contribution. These algorithms address several key challenges and enable the implementation of OnlineGN, described in the subsequent chapter.

Chapter 3 presents in detail the newly developed GN simulator, including its requirements, architectural decisions, system design, and key functionalities. The system is a standalone and entirely novel software component, not currently integrated with existing solutions. A significant scientific and applied contribution is the verification of the reliability and reproducibility of the simulator through various tests and validation procedures at different levels.

Chapter 4 presents several GN models simulated using the developed software, enabling parallel solving of exponential problems and simulation of real-world processes, which represents one of the main applied contributions of the dissertation.

The conclusion and the formulated scientific and applied contributions are well justified. The PhD candidate also outlines future directions for further development, both in the theoretical aspects of Generalized Nets and in their practical applications.

The main results of the dissertation are presented in five scientific publications, with seven citations identified for two of them. Two publications are published in a journal with an impact factor (Mathematics, 11(17/23), IF 2023 = 2.3, Q1).

The submitted abstract accurately reflects the main results and research contributions of the dissertation and is clearly and precisely structured.

Critical remarks: none

Conclusion

I am of the opinion that the dissertation presented here is a comprehensive and meticulously conducted study, which makes significant scientific contributions. It fully satisfies the requirements stated in the Law on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations of the IBFBMI - BAS regarding the conditions and procedures for obtaining scientific degrees. With utmost confidence, I highly recommend the respected Scientific Jury to award Angel Ivanov Dimitriev the educational and scientific degree "Doctor" in the professional field 4.6 "Informatics and Computer Science", PhD program 01.01.12 "Informatics".

Sofia
Date: 16.04.2026r.

Signature:
/assoc. prof/Simeon Ribagin/