

OPINION

by Assoc. Prof. Silvia Nikolaeva Gaftandzhieva, PhD

University of Plovdiv "Paisii Hilendarski"

regarding a dissertation thesis for the award of the educational and scientific degree "**Doctor**" (PhD)

In the Area of Higher Education 4. *Natural Sciences, Mathematics and Informatics*, Professional field
4.6. *Informatics and Computer Sciences*, Doctoral program *Informatics*

Author: Ivan Marianov Ivanov

Topic: *"Model and System for Automated Generation and Verification of Test Questions Using Artificial Intelligence"*

Supervisors: Prof. Stanka Hadzhikoleva, PhD and Prof. Georgi Dimitrov, PhD

1. General Presentation of the Procedure and the Doctoral Candidate

By Order No. RD-22-1413 dated 17.07.2026 of the Rector of University of Plovdiv "Paisii Hilendarski" (PU), I have been appointed as a member of the Scientific Jury to evaluate the defense of a dissertation thesis on the topic "Model and System for Automated Generation and Verification of Test Questions Using Artificial Intelligence" for the acquisition of the educational and scientific degree "Doctor" (PhD) in the Area of Higher Education 4. Natural Sciences, Mathematics and Informatics, Professional Field 4.6. Informatics and Computer Sciences, Doctoral Program "Informatics". The author of the dissertation is Ivan Marianov Ivanov – a full-time doctoral candidate at the Department of Computer Informatics, under the academic supervision of Prof. Stanka Hadzhikoleva, PhD and Prof. Georgi Dimitrov, PhD.

The set of materials submitted by Ivan Ivanov complies with Art. 36 (1) of the Regulations for the Development of the Academic Staff of PU. It includes the necessary documents:

- Application to the Rector of PU for initiating the dissertation defence procedure;
- Curriculum vitae in European format;
- Protocol from the Department Council meeting regarding the preliminary discussion of the dissertation thesis and an opinion from the academic advisors concerning the readiness for preliminary discussion;
- Abstract (autoreferat) in Bulgarian and English;
- A declaration of originality and authenticity of the submitted documents;
- Reference sheet for compliance with the minimal national requirements;
- List of publications for participation in the procedure;
- Complete list of scientific publications;
- List of noticed citations;
- Dissertation thesis;

–Copies of the publications on the topic of the dissertation thesis.

The doctoral candidate has attached 6 publications.

In 2018, doctoral candidate Ivan Ivanov gained a Bachelor's degree at PU (major in Software Technologies and Design), and in 2019 – a Master's degree (major in Software Technologies with a specialisation in Software Architectures and Tools) at the same university. In 2023, he was enrolled as a full-time PhD student at the Department of Computer Informatics at the Faculty of Mathematics and Informatics (FMI) of PU.

Since 2018, the doctoral candidate has worked as an applied programming specialist at EVN Service Centre EOOD in Plovdiv, where he is responsible for developing and maintaining software products.

2. Relevance of the Topic

The rapid development of generative artificial intelligence and large language models (LLMs) in recent years has created the prerequisites for developing intelligent e-assessment solutions. These solutions aim to overcome the limitations of traditional test authoring systems that rely on pre-defined rules and templates and require significant time from educators to construct and validate exam materials manually. Despite the advent of commercial AI tools, pedagogical practice lacks integrated architectural solutions that automate the generation of tests according to specified criteria while simultaneously guaranteeing their quality. This creates a need for developing new models and tools that combine the capabilities of AI with the requirements of pedagogical practice. The development of an intelligent platform for test question generation, based on a multi-model verification approach, addresses the issue of factual errors ("hallucinations") in AI by introducing independent AI control over the generated content.

I find the topic of the dissertation thesis entirely relevant and believe that the formulated tasks allow the main goal of the research to be achieved.

3. Knowledge of the Problem

For his research, Ivan Ivanov has studied 89 literary sources. The bibliographic reference provides grounds to conclude that the doctoral candidate is well-acquainted with the state of research on the problem addressed in the dissertation.

4. Research Methodology

The chosen research methodology is standard for a dissertation thesis in the field of informatics. Based on the results of a study of existing e-testing systems, automated question generation approaches, and the capabilities of generative AI in education, a prototype of an intelligent platform has been designed and developed to automate the generation, verification, management, and adaptive evaluation of test content. Experimental studies were conducted to evaluate the applicability of the

proposed solution, the quality of the generated questions, and the efficiency of the verification algorithms.

The research methodology allows the set goal to be achieved and the tasks solved in the dissertation thesis to be fulfilled.

5. Characterisation and Evaluation of the Dissertation Thesis and Contributions

The dissertation thesis (144 pages) includes an Introduction, 4 chapters, a Conclusion, and an Appendix containing screenshots of the developed system with sample questions generated and evaluated by generative models. The provided lists of abbreviations, tables, figures, and references enhance the clarity of the presentation.

In the Introduction, the doctoral candidate introduces the subject matter of the researched area and outlines the main goal and tasks of the dissertation research.

In Chapter 1, the doctoral candidate explores the possibilities of using AI in education, the application of generative language models and chatbots for e-testing, the evolution of test creation systems, and classical approaches to the automated generation of test questions. Based on the conducted research, the main requirements for modern intelligent e-testing platforms have been formulated.

In Chapter 2, the doctoral candidate proposes a conceptual model of an intelligent e-testing system. The main user roles and functionalities, the architecture of the platform, the mechanisms for generating and verifying test questions via generative AI, the primary use cases, the interactions between system components, and the processes related to the creation, management, and evaluation of test content in an intelligent educational environment are presented in detail.

In Chapter 3, based on the proposed conceptual model of the intelligent platform, the doctoral candidate presents the implementation of a software prototype, the structure of the system, and the main programming modules. The mechanisms for integration with large language models, test content management, the tool implemented for automated evaluation, the chosen architectural solutions, the development process, the interaction between individual system components, and the implemented functionalities for test generation, verification, and administration are described.

In Chapter 4, the doctoral candidate presents the results of the conducted experimental studies and an analysis of the quality of the generated questions, the efficiency of the verification mechanisms, and the applicability of the platform in a real educational environment. The results presented confirm the effectiveness of the proposed platform and its potential for practical application in electronic assessment.

The Conclusion summarises the results achieved in fulfilling the set tasks, describes the contributions, and outlines the prospects for the future development of the conducted research.

The scientific results of the research include an established conceptual framework of an intelligent e-testing platform based on generative AI and a proposed approach for multi-model verifica-

tion of test questions using independent AI models. The scientific-applied results include the developed model of an intelligent platform for the automated generation of test questions using generative language models and parameterised prompts, as well as the proposed mechanism for automated quality assessment of the generated questions through independent AI verification. The applied results of the research are the implemented software prototype of an intelligent e-testing platform and the conducted experimental studies that prove the applicability of the developed solution.

6. Evaluation of Publications and the Personal Contribution of the Doctoral Candidate

The results obtained in the dissertation thesis have been thoroughly tested and presented before a specialised scientific audience, with the main findings reflected in the PhD student's papers. They are presented in 6 peer-reviewed papers, 3 of which are in editions indexed in the world-renowned databases SCOPUS and/or Web of Science, and 1 of the publications in a journal with an impact factor (Q2) and impact rank (Q2). The minimal national requirements for acquiring the educational and scientific degree "Doctor" (PhD) in Professional Field 4.6 are exceeded – 146 points achieved against a minimum requirement of 80 points.

An excellent impression is made by the fact that as of 14.08.2026, there are 29 citations on 2 of the publications related to the topic of the dissertation thesis. This is proof of the relevance of the dissertation research topic and the significance of the achieved results.

I do not doubt the doctoral candidate's personal contribution to the attached publications. I want to note that the doctoral candidate has 2 additional publications that are not on the topic of the dissertation thesis, which are evidence of his interest and continuous pursuit of development in the field of modern information technologies.

7. Dissertation Abstract (Autoreferat)

The abstract, prepared in both Bulgarian and English, is structured in accordance with the current requirements and adequately reflects the content, main results, and contributions of the dissertation thesis.

8. Recommendations for Future Use of the Dissertation Contributions and Results

I have no critical remarks regarding the formatting and presentation of the dissertation thesis. I want to note that this is one of the rare cases in which a doctoral candidate starts the defence procedure immediately after being discharged. This is a clear testament to his high level of organisation, focus, and serious attitude towards scientific research.

The obtained results have the potential for dissemination and multiplication. In this regard, I fully share with the doctoral candidate the prospects for developing the topic. I recommend that the doctoral candidate continue his research in this field and participate more actively in international conferences, thereby allowing a broader international scientific community to appreciate the results achieved.

CONCLUSION

The dissertation thesis contains scientific, scientific-applied, and applied results that represent an original contribution to science and meet the requirements of the Development of Academic Staff in the Republic of Bulgaria Act, the Regulations for the Application of DASRBA, and the respective Regulations of PU "Paisii Hilendarski".

The dissertation thesis shows that the doctoral candidate Ivan Marianov Ivanov possesses in-depth theoretical knowledge and professional skills in the scientific speciality "Informatics", demonstrating qualities and skills needed for independent scientific research.

Due to the above, I confidently give my **positive assessment** of the research presented in the peer-reviewed dissertation thesis, the abstract, results, and contributions. I propose to the honourable Scientific Jury to award the educational and scientific degree "Doctor" (PhD) to Ivan Marianov Ivanov in the Area of Higher Education: 4. Natural Sciences, Mathematics and Informatics, Professional Field 4.6. Informatics and Computer Sciences, Doctoral Program Informatics.

14.08.2026 r.

Prepared the opinion:

Assoc. Prof. Silvia Nikolaeva Gaftandzhieva, PhD