

OPINION

by Prof. Todorka Atanasova Glushkova, PhD
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of a dissertation for awarding the educational and scientific degree "doctor"
in field of higher education 4. Natural sciences, Mathematics, and Informatics,
professional field 4.6. Informatics and Computer Science
doctoral program Informatics

Author: *Ivan Marianov Ivanov*

Title: *A MODEL AND SYSTEM FOR AUTOMATED GENERATION AND
VERIFICATION OF TEST QUESTIONS USING ARTIFICIAL INTELLIGENCE*

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

1. General Presentation of the Procedure and the Doctoral Candidate

The opinion was prepared in accordance with order No. RD-22-1413 of 17.07.2026 of the Rector of Plovdiv University "Paisii Hilendarski", by which I was appointed a member of the scientific jury for ensuring a procedure for the defense of a dissertation on the topic: "Model and system for automated generation and verification of test questions with artificial intelligence" for the acquisition of the educational and scientific degree "doctor" in Professional field 4.6. Informatics and computer sciences. The author of the dissertation is Ivan Marianov Ivanov, a full-time doctoral student at the Department of Computer Informatics of the Faculty of Information Technology at Plovdiv University with scientific supervisors Prof. Dr. Stanka Hadzhikoleva, Prof. Dr. Georgi Dimitrov, report No. PD-21-1461/16.07.2026 by Prof. Dr. Angel Golev, Dean of the Faculty of Mathematics and Informatics at Plovdiv University.

The submitted materials comply with Article 36(1) of the Regulations for the Development of the Academic Staff of Plovdiv University "Paisii Hilendarski".

Ivan Ivanov graduated with a bachelor's degree (2018) and a master's degree (2019) in "Software Technologies and Design" at Plovdiv University. Since 2023, he has been a doctoral student at the same university. His professional path is closely related to software development, and since 2018 he has been working as an application programming specialist at "EVN Center for Services" EOOD, Plovdiv.

2. Relevance of the Research Topic

The topic is relevant, as the digital transformation of education requires new tools to automate routine activities and assist teachers in tracking the development of learners. The use of generative artificial intelligence and large language models (LLMs) for the creation and verification of test content is at the heart of modern technological innovations in education as a whole.

The main goal of the dissertation research is to develop a model, architecture and software implementation of an intelligent e-testing platform using generative artificial intelligence for automated creation, verification, management and assessment of test content. To achieve this goal, the dissertation author has formulated five main tasks related to the study of existing solutions; development of a conceptual model and architecture of an intelligent e-testing platform, including mechanisms for automated generation and verification of test questions using large language models; development of a module for automated adaptive assessment of learners; implementing a software prototype based on the proposed model and conducting experimental research to assess the quality and applicability of the developed solution.

3. Knowledge of the Research Problem

The well-defined goals and objectives in the dissertation on page 12 and the stated motivation speak of the doctoral student's knowledge of the problem area. The author has studied the evolution of electronic testing systems and modern approaches to automated assessment. The bibliography to the work includes over 80 titles in English, which confirms the serious theoretical preparation on the topic.

4. Research Methodology

I believe that the chosen methodology of the study follows the usual developments in the field. The process of developing a conceptual model and architecture, software implementation of a prototype and conducting pilot experiments to validate the proposed solution is described. The human-in-the-loop approach is applied, in which expert assessments serve as a reference standard for analyzing the behavior of artificial intelligence.

5. Characteristics and evaluation of the dissertation work

The dissertation is 144 pages long and consists of an introduction, four chapters, a conclusion, an appendix, a list of the doctoral student's publications, noted citations, and cited references.

The introduction presents the main goal of the dissertation work and the main tasks related to it. Chapter 1 provides an overview of AI in education and the evolution of testing

platforms. Chapter 2 presents the conceptual model with three main roles (administrator, teacher, learner) and a multi-layered architecture. Chapter 3 describes the software implementation of the .NET 10.0 stack, integration with AI providers (ChatGPT, Gemini, Claude), and the use of Item Response Theory (IRT) for adaptive testing. The final fourth chapter describes the experiments conducted with 72 questions, which confirm that the models successfully generate and evaluate pedagogically adequate content. The Conclusion provides an overview of the achieved results in relation to the set goals, summarizes the scientific and scientific-applied contributions, and outlines the prospects for future development of the platform.

To illustrate the conceptual model, software architecture and processes, and the results of the study, 50 figures and UML diagrams and 19 tables are included.

The main contributions of the work are classified as scientific (creation of a conceptual framework and approach for multi-model verification), scientific-applied (model for generation through parameterized prompts), and applied (implemented software prototype and conducted research).

6. Evaluation of the Publications and Personal Contribution

Ivan Ivanov has presented 6 scientific publications on the topic, 3 of which are indexed in the global databases Web of Science and/or SCOPUS. One of the articles is in a journal with IF=2.5 (Q2). 29 citations were noted, which confirms the significance of the work. The results were reported at 4 scientific conferences and are part of 3 research projects. The publications are attached to the reference for minimum national requirements. I have no doubt that the dissertation work and the results obtained are the personal work of the doctoral student. I have not noticed and discovered plagiarism.

The minimum national requirements for obtaining the educational and scientific degree “Doctor” in Professional Field 4.6 Informatics and Computer Science have been fulfilled, according to which at least 30 points must be available in the group of indicators D, and the doctoral student has 96 points, which is more than 300%.

7. Abstract

The abstract meets the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations of Plovdiv University “Paisii Hilendarski”.

8. Critical Remarks and Recommendations

I recommend that the doctoral student continue the research he has begun in the direction of multimodal models (including visual information) and a more in-depth analysis of distractors in the tests.

I have some remarks and recommendations for the developed dissertation:

- I believe that the title of Chapter One "Introduction" is confusing for readers.
- There are some technical and linguistic errors in the text of the dissertation that do not affect the semantic content, but it would be good to refine them in future publications.
- Although the pilot study with 72 questions is sufficient for validating the concept (proof-of-concept), I recommend that in the future the experimental base be expanded with larger samples of questions and the inclusion of more independent expert evaluators to increase statistical significance

I would encourage the doctoral student to further develop his ideas for multimodal models that would allow for automated generation of graphical content for the tests, as well as a more in-depth analysis of the functionality of the distractors. The recommendations made are of a wishful nature and in no way diminish the high scientific and scientific-applied value of the achieved results.

Question: To what extent does the proposed multi-model verification manage to neutralize possible "hallucinations" of artificial intelligence and what is the optimal number of models to achieve consensus in quality assessment?

CONCLUSION

The dissertation contains scientific-applied and applied results representing an original contribution to science and meets the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (ADASRB), the Regulations for its implementation, and the Regulations of Plovdiv University "Paisii Hilendarski".

I believe that Ivan Marianov Ivanov possesses profound theoretical knowledge in Informatics and demonstrates the ability to conduct independent scientific research.

All this gives me grounds for a completely **positive evaluation** of the dissertation.

I propose that the honorable scientific jury award the educational and scientific degree "Doctor" to Ivan Marianov Ivanov the field of higher education 4. Natural Sciences, Mathematics and Informatics, Professional Field 4.6 Informatics and Computer Science, Doctoral Program "Informatics".

5.08.2026
Plovdiv

Prepared by:
/Prof. Todorka Glushkova, PhD/