REVIEW

by Dr. Desislava Ivanova Paneva-Marinova, Professor at

Institute of Mathematics and Informatics, Bulgarian Academy of Sciences

of a dissertation for awarding 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 Science,
PhD Programme "Informatics"

Author: *Ivan Marianov Ivanov*

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

Supervisors: *Prof. Stanka Hadzhikoleva, PhD – Plovdiv University "Paisii Hilendarski" and Prof. Georgi Dimitrov, PhD – University of Library Studies and Information Technologies*

1. General description of the materials submitted

In accordance with Order No. RD-22-1413 of 17.07.2026 of the Rector of Plovdiv University "Paisii Hilendarski" (PU), I have been appointed as a member of the Scientific jury to oversee the procedure for the defense of a dissertation titled "A Model and System for Automated Generation and Verification of Test Questions Using Artificial Intelligence" for the award of the educational and scientific degree "Doctor" in the Area of Higher Education 4. Natural Sciences, Mathematics and Informatics, Professional Field 4.6. Informatics and Computer Science, Doctoral Programme "Informatics". The author of the dissertation is Ivan Marianov Ivanov – a full-time PhD student at the Department of Computer Informatics, with supervisors Prof. Stanka Hadzhikoleva, PhD of Plovdiv University "Paisii Hilendarski" and Prof. Georgi Dimitrov, PhD of the University of Library Studies and Information Technologies.

This opinion has been prepared in accordance with the requirements of the Act on the Development of the Academic Staff in the Republic of Bulgaria (ADASRB), the Regulations for the Implementation of the ADASRB, and the Rules for its implementation and the Rules for the Development of the Academic Staff of University of Plovdiv “Paisii Hilendarski”.

The set of materials submitted in paper form by Ivan Marianov Ivanov is in compliance with Art. 36 (1) of Rules for the Development of the Academic Staff of University of Plovdiv “Paisii Hilendarski”, and includes the following documents:

- application to the Rector of PU for opening a procedure for the defense of a dissertation;
- curriculum vitae in the European format;

- opinion of the supervisors regarding readiness for preliminary discussion;
- minutes of the preliminary discussion of the dissertation at the department;
- dissertation;
- abstract in Bulgarian and English;
- list of scientific publications for participation in the competition;
- complete list of scientific publications;
- copies of the scientific publications;
- list of registered citations;
- declaration of originality and authenticity of the submitted documents;
- report on compliance with the minimum national requirements.

The PhD student has submitted six scientific publications. Three of the publications are indexed in the world-renowned databases Web of Science and/or SCOPUS. One publication is in a prestigious scientific journal with IF=2.5 (Q2) in Web of Science and SJR=0.52 (Q2) in Scopus.

2. Brief biographical information about the PhD student

Ivan Marianov Ivanov was born on 24.04.1995. In 2019, he obtained a Master's degree in "Software Technologies and Design" with a specialization in "Software Architectures and Tools" at Plovdiv University "Paisii Hilendarski". Since 2018, he has worked at EVN Service Center EOOD, Plovdiv, as an "Application Programming" specialist.

3. Relevance of the topic and appropriateness of the objectives and tasks set

The dissertation presents the results of research on artificial intelligence techniques for building a new generation of intelligent e-testing systems. Specifically, the aim is to design and develop a model, architecture, and software implementation of an intelligent e-testing platform that uses generative artificial intelligence for the automated creation, verification, management, and evaluation of test content. The work is highly relevant to the dynamic and rapidly developing fields of e-learning and is of great scientific and practical interest.

4. Knowledge of the problem

Achieving the goal set in the dissertation requires in-depth theoretical knowledge and practical skills. The dissertation and the materials presented show that the PhD student possesses solid theoretical training and a broad view of the modern technologies needed to achieve the stated research goal. He demonstrates good knowledge of the subject of the research, formulates tasks clearly, and carries them out to achieve concrete results. The research conducted is presented competently and with well-substantiated analyses and conclusions.

5. Research methodology

I consider the methodology used by the PhD student to achieve the formulated objectives and corresponding tasks to be appropriate, well-motivated and suitable for the successful implementation of the research, which is evident from the results obtained.

6. Characteristics and assessment of the dissertation

The dissertation of Ivan Marianov Ivanov contains 144 pages, presented through a table of contents, a list of figures, a list of tables, abbreviations used, an introduction, four chapters, a conclusion including the contributions of the dissertation, prospects for future development and approbation (participation in research projects, oral and poster presentations at conferences, a list of publications on the topic of the dissertation, and noted citations), a declaration of originality and authenticity, a bibliography of 89 references, and one appendix.

The object, aim, tasks, and main hypothesis of the research are presented in the **Introduction**.

Chapter 1 presents a current and in-depth analytical review of the role of artificial intelligence in modern education, in particular the application of generative language models and chatbots for e-testing. The development of e-assessment systems and classical approaches to the automated generation of test questions are traced. The formulated requirements for a modern intelligent e-testing platform are scientifically substantiated and build a solid theoretical foundation for the following parts of the dissertation.

Chapter 2 focuses on a structured conceptual solution to the problem under consideration. The developed model of an intelligent e-testing system successfully integrates generative artificial intelligence into the processes of test creation and verification. The architecture, functionalities, mechanisms for generating and verifying test questions through generative artificial intelligence, the

defined user roles, and the analyzed use cases are logically connected and demonstrate the practical applicability of the proposed platform in a modern educational environment.

The software application itself, its implementation, and the technologies used are presented in **Chapter 3**. The mechanisms for integration with large language models, the management of test content, and the implemented tools for automated evaluation are described. The architectural decisions, the development process, and the interaction between the individual components of the system are examined, as well as the implemented functionalities for generating, verifying, and administering tests in an electronic environment.

In **Chapter 4**, the results of the experimental research conducted are discussed and an assessment of the developed solution is made. The quality of the generated questions, the effectiveness of the verification mechanisms, and the applicability of the platform in a real educational environment are analyzed. Results from experiments conducted are also presented, confirming the effectiveness of the proposed approaches and the possibilities for their practical application in the e-assessment process.

The **Conclusion** summarizes the results of the research tasks carried out. The main scientific, scientific-applied, and applied contributions of the research are presented, confirming its relevance and practical significance. The prospects for future development of the research conducted are also outlined.

The dissertation has been carefully developed. The problem area is competently and critically analyzed. The presentation of the developed prototype of the intelligent e-testing platform is comprehensive, well argued, and appropriately illustrated.

7. Contributions and significance of the work for science and practice

The contributions presented have a clear internal logic, covering the full cycle of a scientific study - from theory to practice. The PhD student has successfully classified his achievements into three categories, with a logical sequence observed among them.

The essential scientific contributions of the dissertation are:

- The conceptual framework created for an intelligent e-testing platform based on generative artificial intelligence;

- The proposed approach for multi-model verification of test questions using independent AI models.

The scientific-applied contributions are as follows:

• The developed model of an intelligent platform for the automated generation of test questions using generative language models and parameterized prompts;

• The proposed mechanism for the automated assessment of the quality of generated questions through independent AI verification.

As an applied contribution, mention should be made of the implemented software prototype of the intelligent e-testing platform, with functionalities for the automated generation, verification, and management of test questions, and the experiments conducted with it, which demonstrate the applicability of the developed solution.

The contributions presented outline a complete and up-to-date study with high potential for development. Through the successful combination of an innovative conceptual framework, scientifically substantiated algorithms for multi-model verification, and a working software prototype, the dissertation offers an effective and technologically mature solution. The work successfully overcomes key challenges in the implementation of generative artificial intelligence in education and lays a solid foundation for the future automation and optimization of e-assessment processes.

8. Assessment of the publications related to the dissertation

The author's list of publications related to the substance of the dissertation includes 6 titles, 3 of which are in journals indexed in Scopus or Web of Science. One publication is in the prestigious scientific journal *Applied Sciences*. The journal has a JCR quartile of Q2 and IF=2.5 in Web of Science, as well as SJR=0.52 (Q2) in Scopus. Four publications are in international and national refereed scientific journals, and 2 are in the proceedings of an international scientific conference. Four of the publications are in English, and two are in Bulgarian. Ivan Ivanov is first author on three publications. All publications are co-authored (by number of co-authors: with one co-author - 2; with two co-authors - 2; with three or more co-authors - 2). Noted citations: 29. The PhD student has presented results at two international and two national scientific conferences. He has participated in three research projects.

Based on the data provided, the PhD student's scientific output meets the standards established in Bulgaria. Excellent preparation and recognition of the scientific results achieved have been demonstrated.

9. Personal contribution of the PhD student

Based on the materials submitted, I conclude that the dissertation is the result of the doctoral candidate's independent research. The presentation, analysis, and stated scientific contributions attest to a significant personal contribution to the development of the research.

10. Abstract

The abstract is 32 pages long and correctly reflects the structure of the dissertation, the results obtained, and the conclusions drawn from the study. The requirements of the Act for the Development of the Academic Staff in the Republic of Bulgaria, the Rules for its implementation and the Rules for the Development of the Academic Staff of University of Plovdiv "Paisii Hilendarski" have been met.

11. Critical remarks and recommendations

I have no critical remarks or recommendations regarding the dissertation and materials presented.

12. Personal impressions

I do not know the PhD student personally, and my impressions are based solely on the dissertation and materials presented.

13. Recommendations for future use of the dissertation's contributions and results

The results achieved have undeniable practical value and are distinguished by an exceptionally high degree of applicability in a real educational process. The developed model and system can be easily and effectively integrated into curricula, which will improve the quality of teaching and provide new added value to the educational process.

The chosen topic has great potential for future development. The results achieved open broad horizons for further scientific research, optimization of methods, and expansion of the range of applications. I recommend that Ivan Ivanov continue his research in this field and expand its dissemination in the scientific community.

CONCLUSION

The dissertation contains ***scientific, scientific-applied, and applied results that represent an original contribution to science*** and ***meet all the requirements*** of the Act for the Development of the Academic Staff in the Republic of Bulgaria, the Rules for its implementation and the Rules for the Development of the Academic Staff of University of Plovdiv “Paisii Hilendarski”.

The dissertation shows that the PhD student Ivan Marianov Ivanov **possesses** in-depth theoretical knowledge and professional skills in the scientific specialty "Informatics", **demonstrating** qualities and skills for conducting independent scientific research.

In view of the foregoing, I confidently give my **positive assessment** of the research conducted, presented in the dissertation, abstract, results achieved, and contributions reviewed above, and ***I propose to the esteemed Scientific jury that it award the educational and scientific degree "Doctor"*** to Ivan Marianov Ivanov in the Area of Higher Education 4. Natural Sciences, Mathematics and Informatics, Professional Field 4.6. Informatics and Computer Science, Doctoral Programme "Informatics".

13.08.2026

Reviewer: .....
(signature)
Prof. Dr. Desislava Paneva-Marinova