OPINION

From: Prof. Magdalena Zlatkova Garvanova, PhD
University of Library Studies and Information Technologies
PF 4.6 "Informatics and Computer Sciences"

Subject: Dissertation for awarding an educational and scientific degree "PhD" in PF 4.6 "Informatics and Computer Sciences" under the doctoral program "Informatics" at IICT-BAS

Grounds for submitting the opinion: participation in a scientific jury for the defense of the dissertation in accordance with Order No. 75/27.03.20206 of the Director of IICT-BAS

Author of the dissertation:	Miroslava Doncheva Dimitrova
Topic of the dissertation:	Evaluation Framework of Retrieval-Augmented Generation
Scientific supervisor:	Acad. Ivan Popchev

1. Information about the doctoral student and the dissertation

The PhD student studied under the doctoral program "Informatics" at IICT-BAS on a full-time basis. She has been deducted with the right of defense in accordance with the Order of the Director of IICT-BAS No. 336/22.12.2025 with the right of defense, as of 01.01.2026.

I do not know the doctoral student Miroslava Dimitrova and I have no joint publications with her. At the first meeting of the scientific jury, I was chosen to write an opinion and received a full set of documents in electronic format.

The submitted dissertation consists of 215 pages, formatted in an introduction, five chapters, a conclusion, appendices, a list of publications, a list of citations noticed, a declaration of originality of the results and a bibliography. To illustrate the results, 24 figures, 45 tables, and 34 equations are presented. 145 relevant references are used.

Aim of the research is to develop a framework for evaluating Retrieval-Augmented Generation (RAG), which supports decision-making for configuring retrieval in RAG systems in open-source language models, with particular emphasis on setting the similarity threshold.

To achieve this goal, the following **tasks** have been formulated:

1. To define and implement the main components of the evaluation framework.
2. Establish criteria for the selection of models.
3. To define procedures for the selection and calculation of metrics.
4. Conduct controlled testing and analysis.

Structure of the dissertation is logical and consistent:

In the *Introduction*, the purpose and tasks of the dissertation research are formulated and a brief description of the content of the material is done.

Chapter One lays the foundations of the dissertation by reviewing scientific publications on the topic of RAG, assessment practices and challenges to reproducibility, and positioning D1–D3 deficits within the relevant literature.

Chapter Two introduces the infrastructure of the PaSSER platform. It examines the workflow, configuration of the various settings, automated testing process, and traceability via blockchain.

Chapter Three justifies the choice of models and defines the evaluation metrics and the procedures for their calculation applied in the benchmarking between models.

Chapter Four presents the empirical results of controlled testing on datasets in the areas of agriculture and biodiversity, analysing sensitivity to the similarity threshold, model performance and comparison between thematic areas.

Chapter Five discusses research questions and applied scientific contributions, examines limitations, and outlines future directions for research.

Conclusion summarizes the main results.

Topic of the dissertation is extremely relevant and significant both from a scientific and practical point of view. It is dedicated to the problem of increasing the accuracy and reliability of generative AI models with information from specialized sources, as well as the evaluation of RAG systems.

2. Evaluation of the scientific and applied scientific results obtained

The dissertation of Miroslava Dimitrova is an independent, logically structured and methodologically sound scientific research with a clearly expressed practical orientation. The set goal has been fulfilled, and the tasks have been realized in full in the course of the research.

In view of the above, I believe that the dissertation meets the requirements of the Development of Academic Staff in the Republic of Bulgaria Act (DASRBA) and the Regulations on the Implementation of the Development of Academic Staff in the Republic of Bulgaria Act (RIDASRBA). I have not noticed plagiarism in the publications and the dissertation under this procedure.

3. Assessment of scientific and applied scientific contributions

The results of Miroslava Dimitrova's research enrich the existing scientific field with new knowledge. The contributions to the dissertation can be summarized as:

1. A procedure for evaluating a RAG system using the CPS, T-CPS and Balance Score metrics has been developed. This procedure allows to study the effect of

the threshold configuration and its impact on the quality and stability of the generated responses.

2. The PaSSER platform with integrated blockchain-based tracking of the origin of results has been developed.

3. Empirical data on threshold sensitivity of seven open models (Mistral 7B, Llama 2 7B, Orca 2 7B, Granite 3.2 8B, DeepSeek R1-8B, Llama 3.1 8B, Mistral 7B v0.3) are provided in two domains (agriculture and biodiversity).

4. Evaluation of dissertation publications

PhD student Miroslava Dimitrova has approved parts of her dissertation in 5 scientific publications: 2 publications are indexed in JCR-IF (Web of Science) and SJR (Scopus), 2 conference papers are indexed in the IEEE Xplore Digital Library, and 1 article is published in the journal of Prof. Marin Drinov Publishing House of BAS.

According to the minimum national requirements for obtaining a PhD degree under PF 4.6 "Informatics and Computer Sciences", defined in Art. 2b, para. 2 and 3 of the LDASRB and respectively under Art. 24, para. 1 of the RILDASRB requires the presence of at least 30 points for the indicators from Group D. The presented publications on the dissertation form a total sum of the points for the indicators from Group D equal to 156 points, which exceeds the required minimum of 30 points several times.

64 citations of 4 of the publications of the PhD student were noticed, which is indisputable evidence of the high scientific value of the results obtained.

5. Evaluation of the abstract

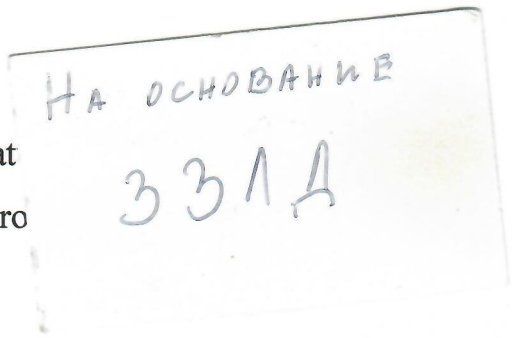
The presented abstract reliably reflects the structure and content of the dissertation and corresponds to the requirements of the DASRBA and the RIDASRBA.

6. Critical notes, recommendations, and questions

I have no critical notes on the dissertation. I recommend Miroslava Dimitrova to continue to work hard and publish her scientific findings in prestigious forums and publications.

7. Conclusion

I believe that the presented dissertation meets the requirements of the DASRBA, the RIDASRBA, and the specific requirements of IICT-BAS. The results achieved give me grounds ***to give a positive assessment with full conviction*** and I recommend to the honorable scientific jury to award the educational and scientific degree "PhD" to Miroslava Doncheva Dimitrova in PF 4.6 "Informatics and Computer Sciences" under the doctoral program "Informatics".



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