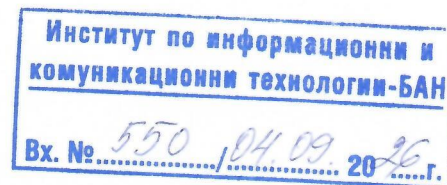


KONSTANTIN
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ШУМЕНСКИ УНИВЕРСИТЕТ
“ЕПИСКОП КОНСТАНТИН ПРЕСЛАВСКИ”
ЗАЕДНО ПИШЕМ ИСТОРИЯТА



REVIEW

By Prof. Krasimir Mitkov Kordov, PhD
Konstantin Preslavsky University of Shumen

of the dissertation of Kristel Gjergj Vula, entitled
**„Transformer-Based Detection and Epidemic-Model Analysis of Fake-News
Dynamics on Social Networks”**

presented for obtaining the educational and scientific degree „Doctor”, in the
professional field 4.6 „Informatics and Computer Sciences”.

Shumen

2026

By order of the Director of IICT-BAS and by the decision of the first session of the Scientific Jury, I have been appointed as a reviewer for this procedure. This review is prepared in accordance with the Development of the Academic Staff in the Republic of Bulgaria Act, the Regulations for its implementation, and the Regulations of IICT-BAS. As of the time of writing this review, no reports of procedural violations have been submitted.

1. Documents

As a reviewer, the following documents are presented to me:

- 1.1. Application for opening the procedure;
- 1.2. Dissertation thesis entitled: „Transformer-Based Detection and Epidemic-Model Analysis of Fake-News Dynamics on Social Networks”;
- 1.3. Declaration of originality of results;
- 1.4. Abstract in English;
- 1.5. Order for dismissal (graduation with the right to defense);
- 1.6. List of publications related to the dissertation and the publications themselves;
- 1.7. Report on the fulfillment of the minimum requirements of IICT;
- 1.8. Report for registration in NACID;
- 1.9. Preliminary opinion on the dissertation;
- 1.10. Full similarity report (plagiarism check);
- 1.11. Birth certificate.

2. Brief assessment of the submitted documentation

The documentation is complete and formatted according to regulatory requirements. It provides a clear overview of the doctoral student's qualifications and the credibility of the results. The similarity report shows no unauthorized use of foreign text, which confirms the independent nature of the scientific research. As of the time of writing this review, I have no data regarding plagiarism.

3. Relevance of the dissertation

The topic is exceptionally relevant and holds high public significance. In today's digitalized world, the spread of fake news and disinformation poses a serious challenge, threatening public trust, democratic institutions, and the stability of key sectors such as healthcare and finance. Traditional research in cyberspace focuses primarily on text classification (whether the content is fake or not), which proves to be largely insufficient as it does not explain the temporal and structural dynamics of cascading spread in social networks. The present work proposes an original integrated „content-to-cascade“ approach that combines semantic classification via transformer models with the study of propagation dynamics.

4. Description of the dissertation

The dissertation has a total volume of 210 pages and consists of an introduction, 3 chapters, a conclusion summarizing the obtained results and directions for future work, a list of contributions, a list of publications, a declaration of originality, and a bibliography of 191 sources. The content includes 46 figures (33 in the main text and

13 in the appendices), 111 tables (41 in the main text and 70 in the appendices), a list of abbreviations, and 8 appendices.

The Introduction presents the motivation for writing the dissertation, the social and technological significance of fake news and disinformation, as well as the need to analyze false information through innovative approaches.

Chapter One is introductory and provides a detailed and analytical overview of the definitions of fake news, classical and transformer-based detection methods, hybrid approaches, diffusion in temporal networks, epidemic models, etc.

Chapter Two presents the research framework based on transformers and an epidemic model, the selection of datasets, and their preprocessing for predicting the risk of fake news dissemination. The proposed methodology separates text classification datasets from temporal cascade datasets, successfully bridging semantic content analysis with the dynamic risk of network propagation.

Chapter Three describes the experimental implementation and validation of the developed framework using text datasets (fake news content) and diffusion-oriented cascades in social networks. Results obtained from detection, propagation forecasting, and scenarios for counteraction and intervention are reported.

The Conclusion summarizes the dissertation results, outlines directions for future work, and presents the contributions, publications, and citations related to the dissertation.

From the presented 191 literature sources it is clear that an extensive and in-depth literature review of the problem has been conducted.

5. Contributions

The dissertation outlines 8 contributions. Although they are not explicitly categorized, I accept the following summary:

Scientific Contributions:

Contribution 7 presents a mathematical model for determining the combined risk, establishing the threat level of the text and the cascading spread of fake news in social networks.

Scientific - Applied Contributions:

Contributions 1, 2, 5, 6, and 8 present methodologies and models for the research conducted in the dissertation.

Applied Contributions:

Contributions 3 and 4 are related to the empirical research conducted in the dissertation.

6. Abstract

The abstract of the dissertation is 57 pages in volume and adequately reflects the structure and content of the dissertation manuscript and the results presented in it. All necessary structural elements of the dissertation are included.

7. Publications

Five publications in English have been published based on the dissertation. Four of the publications are indexed in SCOPUS (three in IEEE international conference proceedings and one in a Springer series), with one publication holding an impact rank of SJR 0.123, Q4. The citation rate of the publications reflects their significance in scientific circles. The scientific value of the work is also supported by the prestigious Best Poster Award presented by IEEE Women in Engineering at the TechDefense 2025 forum.

From the presented publications, it is evident that Kristel Vula exceeds the minimum national requirements of the ZRASRB and the specific requirements of IICT-BAS for obtaining the educational and scientific degree „Doctor“, in scientific area 4. „Natural sciences, Mathematics and Informatics“, in professional field 4.6 „Informatics and Computer Sciences“.

8. Critical assessments, remarks and recommendations

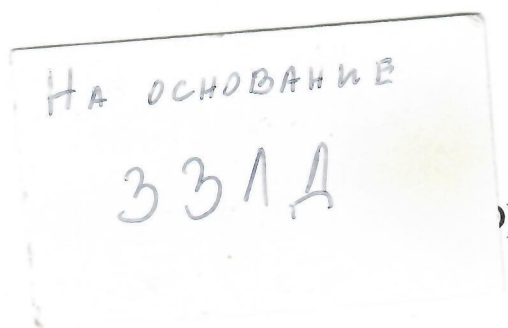
- The defined goals, tasks, and object of research could be presented more concisely and clearly.
- The contributions are overly descriptive and lack explicit categorization.
- Some technical and stylistic errors are noticeable in the text (e.g., the numbering of sections 3.2 and 3.3 is swapped).
- I recommend publishing sole-authored publications.

9. Conclusion

In conclusion of my review, considering the presented dissertation, I note the relevance of the topic, the in-depth study of the subject area and the obtained contributions. The remarks and the recommendations do not diminish the achieved results. I consider that the presented work is completely sufficient in volume and quality and meets the requirements of the Act for the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its implementation and the Regulations of IICT-BAS. I give a positive assessment of the presented work on „Transformer-Based Detection and Epidemic-Model Analysis of Fake-News Dynamics on Social Networks“, and I propose to the esteemed Scientific Jury to

award Kristel Gjergj Vula the educational and scientific degree „Doctor” in scientific area 4. „Natural sciences, Mathematics and Informatics”, in professional field 4.6 „Informatics and Computer Sciences”.

Date: 02.09.2026



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