

OPINION
on the dissertation
for the acquisition of the educational and scientific degree "Doctor" in

Field of higher education – 5. Technical Sciences,
Professional field – 5.3. Communication and computer technology,
Doctoral program – "Communication Networks and Systems"

Author of the dissertation: Eng. Teodora Valentinova Zhorova

Thesis topic: "Traffic Monitoring in Communication Systems with Artificial Intelligence"

Member of the scientific jury: Prof. Todor Dimitrov Ganchev, TU–Varna

1. Topic and relevance

The application area covers AI-based distributed systems for information acquisition, transmission and processing, which are currently increasingly using modern technological solutions. I find the topics presented in the dissertation to be relevant, and the proposed developments and improvements can undoubtedly find their significant role in improving the security of information in communication and data transfer systems. The research focus is on the development of methods and tools for adaptive monitoring, diagnostics and forecasting of interferences and traffic characteristics in the transmission communication environment, while ensuring the cybersecurity and information security of network and communication resources, have the potential to achieve significant social and economic impact.

Specifically, the dissertation is positioned in an extremely dynamically developing scientific and applied field related to the integration of artificial intelligence and machine learning in communication networks, including in the context of 5G/6G infrastructures, IoT and AIoT systems. Of particular importance is the focus on the analysis of multiplexed signals in passive optical networks, where there is increasing complexity of traffic, increased requirements for QoS/QoE and the need for intelligent automation of diagnostic processes.

The relevance of this study is also supported by the fact that modern communication systems require high resistance to noise, interference and cyberattacks, which requires the use of intelligent methods for classification, forecasting and optimization. In this sense, the approaches developed in the dissertation have the potential to be applied both in future research and in innovative industrial solutions.

2. Research methodology

My overall impression is that a large amount of research has been carried out and presented in Chapters 2, 3 and 4. The exposition in these chapters has an adequate degree of completion and a good style of presentation of the results. The conclusions to each of the chapters are, in most cases, clear, although not always traceable to specific texts and conclusions in the respective sections.

Methodologically, the dissertation is using a composite and interdisciplinary approach, including modern methods in the field of digital signal processing, traditional methods of machine learning, statistical analysis and regression modelling.

A positive impression is made by the systematic approach, including data pre-processing, extraction of informative features, selection and verification of models and evaluation of performance through appropriate metrics.

The research presented in the dissertation demonstrates good consistency: from theoretical analysis, through modelling, to experimental verification. This shows that Eng. Zhorova has an adequate research maturity and demonstrated good ability to conduct application-oriented research activities.

3. Contributions of the dissertation

Based on the exposition and the statements formulated in the dissertation, the following categories of contributions can be highlighted.

Applied research contributions

- A generalized methodological framework for analysis and diagnosis of multiplexed signals in communication networks using AI-based approaches has been developed.
- Systematization and adaptation of traditional machine learning methods to the tasks of classification and forecasting of network traffic and noise impacts has been carried out.
- Models for assessing the impact of different types of noise on the quality of the transmission medium are proposed.
- Algorithms for intelligent monitoring and diagnostics of communication channels have been developed, applicable in real network environments.
- Models for forecasting traffic characteristics and anomalies have been implemented, with the potential for implementation in network security systems.
- Optimization approaches to improve QoS/QoE parameters in communication systems are proposed.

Applied results

- The potential effectiveness of the proposed methods is demonstrated through relevant experimental studies.
- The possibility of integration into cybersecurity systems and network traffic management is shown.

Overall, it is good that the contributions are clearly formulated and correctly positioned in relation to existing research.

4. Publications and citations

The research presented in this dissertation has a clear focus, logical stages of development of the research activity are followed, as presented in Chapters 2, 3 and 4. The developments have been tested in 3 RTD projects of the department and are presented in 7 publications, including 2 indexed in SCOPUS. Six of these publications are co-authored and one is authored solely by Eng. Zhorova. One of the publications in co-authorship is prepared in Bulgarian language. One of the co-authored publications, entitled "*Internet traffic analysis by ...*", was awarded the "*Best Paper Award*". An up-to-date check in SCOPUS shows that as of 04.05.2026, there are no citations of the publications of Eng. T. Zhorova.

My overall impression is that the publication activity satisfies the requirements for the acquisition of the PhD degree, sufficiently reflecting the main aspects of the research carried out on the subject of the dissertation. There is an excellent correlation between the content of the dissertation and the published results, which is an indicator of consistency and scientific credibility. From the provided references it is evident that the minimum national criteria for the acquisition of the Doctor's degree are exceeded. Specifically, according to the group of indicators "G", the publications of Eng. Zhorova contribute to a total of 74 points, with only 30 points required according to the minimum national criteria.

5. Authorship of the results

After getting acquainted with the full text of all publications and the exposition in the dissertation, I support my opinion that the reported results represent authentic research of the team, in which the PhD student has a clear role. Eng. Zhorova is the first author in 2 publications and in another 4 she is the second author, which is a good indication of her active contribution. It can be added that her participation in all key stages of the study: modelling, experimental validation and analysis of the results indicates proper understanding of the problems addressed in these papers.

6. Opinions, recommendations and remarks on the dissertation

I have no remarks on the substance of the research work, the research carried out and the reported results. My comments and recommendations during the preliminary discussion of the dissertation were considered in the final version of the exposition. With the idea of being useful, I would recommend that the focus of future research should be on (i) expanding the experimental base with real industrial data, (ii) developing prototype systems for implementation in real network environments, (iii) deepening research towards Explainable AI in communication systems.

7. Conclusion

In summary, I express my opinion that the dissertation submitted for consideration offers a broad, socially important research, which contains enough innovations and RTD contributions and demonstrates the ability of Eng. T. Zhorova for individual scientific work. I deem that in its current form, the dissertation **meets** all requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria.

The results presented in the dissertation give me grounds **to support Eng. Teodora Valentinova Zhorova**, and therefore, I propose that she is awarded the PhD degree in the field of higher education – 5. Technical Sciences, professional field – 5.3. Communication and Computer Technology, PhD program – "Communication Networks and Systems".

04.05.2026

Signature: _____
/Prof. Todor Ganchev/