OPINION

for Dissertation
for the acquisition of ESD "Doctor" in

the field of higher eduacation – 5. Technical Sciences
professional field – 5.3. Communication and Computer Technology
the scientific specialty – "Communication Networks and Systems"

developed by: Mag. Eng. Dionisia Antimos Daskalaki
Topic: „Detection and analysis through communication channels of physical characteristics of metals, using ultrasonic sensors"
Member of the scientific jury: Assoc. Prof. Eng. Ivelina Stefanova Balabanova, PhD

1. Topic and relevance of the dissertation work

The activities in areas such as mechanical engineering, construction, transport, metallurgy, agriculture, medicine, communications in the installation and construction of equipment and routes and other industrial sectors are associated with testing of metal objects and study of changes in their characteristics under the influence of different forces and loads in the recent years. The compact devices or conventional instruments, equipment and machines can be the the role of the tested metal objects. The measurement processes are based on the use of highly efficient sensor systems:

- for monitoring, monitoring and registration of non-electrical impacts:
- computational mathematical apparatus designed for:
  - ✓ processing and analysis of measurement information;
  - ✓ detection of anomalies in the transmitted signals;
  - ✓ ensuring adequate servicing of packet data requests.

All this gives me ground to determine the chosen topic of the dissertation and the possibility of adapting and integrating the technology of artificial intelligence in the various phases of research as particularly relevant and relevant to practice and industry.

2. Research methodology

The applied research methodology in the dissertation is the basis of the tools of artificial intelligence, mathematical and applied statistics. The apparatus includes include Feed-Forward Neural Networks, Generalized Regression Neural Networks, Cascade-Forward Neural Networks, Descriptive, Correlation and Regression Analysis. The artificial neural network training procedures are based on the Levenberg-Marquardt and Scaled Conjugate Garadient gradient algorithms. The activities are conducted mainly with the help of LabVIEW, MATLAB, STATISTICA and Java Modeling Tool software products. These neural models concern an identification and predictive analytical procedures in the following areas:

- interfering effects and superimposed random noises to analog and digital signals transmitted in communication channels for communication in sensor and information-communication systems;
- establishment of working transducers and quantitative analysis of impact forces applied on the surface of experimental metal samples of different shape and weight;
- forecasting the volume of traffic served in order to ensure the quality of service and congestion of system resources in information and communication structures for industrial purposes.

3. Contributions of the dissertation work

I accept the formulated scientific-applied and applied contributions which fully reflecting the key accents and achievements of the activities carried out at the various stages of the dissertation in the main areas. The presented contributions to the dissertation presentation are in accordance with the definitions attached in the previously prepared review. My personal opinion is that there is no need to make new additions to the current ones or to include new contributions.

4. Publications and citations of publications on the dissertation work

Regarding the acquaintance of the scientific community at national and international level with the achieved results have been realized dissertation a total of six scientific publications as one is independent and five are co-authored. Two of the publications are presented in refereed foreign publications "Journal of Engineering Science and Technology Review" and "Advances in Intelligent Systems and Computing" with Impact Rank SJR 0.190 and SJR 0.184. One indexed paper is issued at the "National Scientific Conference with International Participation 'TechCo'" of the Technical College in Lovech and two at the "International Scientific Conference" Unitech "at the Technical University - Gabrovo. One publication is presented in the Proceedings of the International Scientific Conference "Conference on Communications, Information, Electronic and Energy Systems - CIEES" of the University of Ruse "Angel Kanchev", whose issue is indexed in international databases IEEE and Scopus.

5. Authorship of the obtained results

The dissertation summarizes and presents a large amount of empirical data and results, which confirming the correctness of the research and the performance of the synthesized neural and analytical models for identification and predictive analysis. My personal opinion that a significant part of the experiments and analyzes conducted in real and simulation environments are the personal contribution of the doctoral student Mag. Eng. Dionisia Daskalaki under the guidance of her supervisor. The in-depth impressive knowledge of the doctoral student's apparatus of artificial intelligence in the introduced methodological sequences on the basis of selected algorithms and criteria which are applied in the research.

6. Comments, recommendations and remarks on the dissertation work

At this stage not significant recommendations and comments in connection with the presentation of the dissertation can be given. The PhD student made timely adjustments and made the necessary additions to the individual sections and sections of the dissertation chapters, which were defined in the preliminary review. With regard to upgrading the scope of the dissertation, In my opinion Mag. Eng. Dionisia Daskalaki should continue to the development of her scientific interests in these areas, expanded the volume of her publishing activities in more peer-reviewed scientific journals, as well as her participation in various national and international projects of high importance.

7. Conclusion

My personal opinion is that the presented PhD thesis meets the requirements of the Law for the Development of Academic Staff in the Republic of Bulgaria. The achieved results give me grounds to propose to obtain the educational and scientific degree "Doctor" from Eng. Dionisia Antimos Daskalaki in:

in the field of higher education 5. Technical Sciences,

in professional field 5.3. Communication and Computer Technology,

in the scientific specialty – „Communication Networks and Systems".

15.06.2022 г.

Member of the Scientific Jury:..……/signature/………..

/ Assoc. Prof. I. S. BALABANOVA, PhD /