Short Review

of the thesis of Ventsislav Polimenov
"Adaptive Neural Network for Processing Satellite Data
with Different Spatial and Spectral Characteristics",
presented for awarding the educational and scientific degree "doctor"
in Professional area 4.6 Informatics and Computer Science

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Pursuant to Order 44/18.05.2026 of the Director of IMI – BAS I was appointed a member of the scientific jury for the defense of the submitted thesis in professional area 4.6 Informatics and Computer Science, entitled "Adaptive Neural Network for Processing Satellite Data with Different Spatial and Spectral Characteristics".

1. General characteristics of the dissertation and the presented materials

The dissertation is written in English and contains 138 pages of text, including five chapters; a list of references; lists of tables, figures, and abbreviations used.

In addition to the dissertation, the following documents are also presented:

- abstract in Bulgarian and abstract in English;
- list of publications on dissertation results;
- copies of publications on dissertation results;
- report on the contributions of the dissertation;
- CV of the PhD student;
- declaration of authorship of the thesis.

2. Applicant data

Ventsislav Polimenov holds a BSc degree in Computer Science from the University of Essex, UK, and a MSc degree in Computer Science from the University of Bristol, UK. He has gained significant practical experience in the fields of data science and machine learning. Since the end of

2022, he has been working at the Institute of Mathematics and Computer Science – Bulgarian Academy of Sciences.

I have no direct personal impressions of the doctoral student's work and performances.

3. Relevance of the research area and significance of the research problem

The dissertation is dedicated to research in the field of development and applications of deep learning models in precision agriculture. It proposes a solution to many issues related to the creation of a multi-sensor framework for operational evaluation of the leaf area index. The area of research in the dissertation is complex and topical, its relevance being determined by the serious limitations of traditional field measurements and the reported challenges facing existing satellite approaches.

The goal of the dissertation and the tasks for achieving this goal, which the doctoral student defines, are determined after a thorough analysis of the achievements and open questions in the research field. The goal set is significant, and the tasks are in full accordance with the goal. The chosen approach to achieving the goal is adequate and promising.

4. Analysis of the results and contributions of the doctoral thesis

The dissertation presents and analyzes the author's results in relation to the development and analysis of a multi-sensor deep learning framework designed for operational assessment of the leaf area index based on satellite data.

The following can be summarized as most significant contributions of the doctoral thesis of Ventsislav Polimenov:

- A new multi-sensor model for deep learning has been developed, which integrates multiple specialized deep neural network architectures into a single architecture for sensor-invariant learning without prior harmonization of the input data.
- An original method for balancing training on multi-sensor data has been proposed.
- A multi-level framework for validation of models for estimating the leaf area index has been proposed.
- A methodology for estimating the leaf area index from multi-sensor satellite data over agricultural areas in Bulgaria has been implemented.

- An integrated computational framework for processing multispectral satellite images, training deep neural models and generating full-scene area leaf area index maps has been developed.

The doctoral thesis makes an excellent impression with the scope and depth of its presentation. The field of research is modern and complex, and achieving significant results in it requires serious interdisciplinary knowledge and skills, constant and intensive work. The achieved results are original and significant and fully correspond to the defined objectives.

5. Publications on the doctoral thesis. Reflection on the works of other authors

The results obtained in the doctoral thesis are published in three papers in proceedings of international scientific conferences indexed in Scopus, one of which has SJR for the year of publication, and the other two were published by IEEE.

All papers in this list are co-authored. I suppose that all co-authors have contributed equally to each of the collective publications. As of the date of finalization of this review, two citations of one of these publications in works by other authors have been noted.

In this way, the requirements of the Regulations for the terms and conditions for acquiring scientific degrees and for holding academic positions at the Bulgarian Academy of Sciences have been entirely fulfilled.

6. Abstract

The abstract meets all the requirements for its preparation and fully and accurately presents the topic, purpose, content, achieved results and contributions of the dissertation.

7. Critical Remarks and Recommendations

I have no significant critical comments on the doctoral thesis of Ventsislav Polimenov . I am aware of the fact that serious research in the scientific field in which he works is generally a collective matter, but I recommend him to aspire in his future work to some single-authored journal publications, presenting results to which he has a key contribution.

8. Summary

Summing up, I consider that the doctoral thesis of Ventsislav Polimenov satisfies the requirements of the national regulations and the specific conditions and requirements of the Bulgarian Academy of Sciences. Its author has achieved significant research results that make an original contribution to the chosen field of study. My assessment of the dissertation, the abstract, the publications and the scientific contributions of their author, Ventsislav Polimenov , is **positive**.

Therefore, **I advise the honorable scientific jury to award to Ventsislav Polimenov the educational and scientific degree "doctor" in professional area 4.6 Informatics and Computer Science**.

Sofia, June 29, 2026 Prof. Dr. Maria Nisheva-Pavlova