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Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Svetlana Illarionova

PhD Program: Computational and Data Science and Engineering

Title of Thesis: DEEP LEARNING FOR REMOTE SENSING OF ENVIRONMENT AND LAND COVER ANALYSIS

Supervisor: Prof. Ivan Oseledets

Name of the Reviewer: Maxim Panov, Senior Researcher, Technology Innovation Institute, UAE

I confirm the absence of any conflict of interest.	Signature:
	Date: 10-01-2023

The purpose of this report is to obtain an independent review from the members of PhD defense Jury before the thesis defense. The members of PhD defense Jury are asked to submit signed copy of the report at least 30 days prior the thesis defense. The Reviewers are asked to bring a copy of the completed report to the thesis defense and to discuss the contents of each report with each other before the thesis defense.

If the reviewers have any queries about the thesis which they wish to raise in advance, please contact the Chair of the Jury.

Reviewer's Report

Reviewers report should contain the following items:

- Brief evaluation of the thesis quality and overall structure of the dissertation.
- The relevance of the topic of dissertation work to its actual content
- The relevance of the methods used in the dissertation
- The scientific significance of the results obtained and their compliance with the international level and current state of the art
- The relevance of the obtained results to applications (if applicable)
- The quality of publications

The summary of issues to be addressed before/during the thesis defense

The considered thesis targets a very important area of remote sensing of Earth surface. The author considers several important problems:

1. Precision forest mask estimation;
2. Dominant forest species classification;
3. Canopy height model prediction;
4. Artificial satellite band generation.

All these topics are relevant for modern machine learning and data analysis. The author shows fluency in state-of-the-art computer vision methods and their applications to remote sensing. Moreover, some of the methods require non-trivial modifications and lead to the algorithms, which are interesting for this area in general.

Speaking about writing and presentation I have some concerns. I think that the text deserves a better adaptation of the corresponding articles. For example, on page 71 the author refers to their previous publication. But this publication is mentioned in the list of publications that contribute to the thesis itself. There are some other places with similar confusion. I would recommend the author to read the text from beginning to end and perform some harmonization. I should also note that introduction and literature review chapters are well written.

In my opinion, thesis results are very relevant from the application perspective. Importantly, the author provides all the details on the algorithm construction and training procedures, which allows to directly applying them.

Finally, the results of the thesis research were published in well-reputed journals including 7 publications in Q1 journals. Thus, the quality of the publications well supports the overall good scientific quality of Svetlana's thesis research.

I have overall positive opinion about the research contents of the thesis, while writing deserves some minor improvements (see also some issues below). To sum up, I think that the issues found do not decrease the scientific quality of the thesis and Svetlana Illarionova deserves to be awarded with Skoltech PhD degree.

The list of issues (in the order of appearance in the text):

1. [publication 1] requires full bibliographic reference (number, volume, pages, …)
2. [caption of table 2.1] Some of the links to references are strange, i.e., 'a'.
3. [page 91 and many others] It is better to use \cite{ref1, ref2} than \cite{ref1}, \cite{ref2}
4. [formulas everywhere] I recommend formulas to be integrated in the text with comma, dots and so on. Currently, it is only very sparsely implemented.

Provisional Recommendation

| X | *I recommend that the candidate should defend the thesis by means of a formal thesis defense* |

☐ *I recommend that the candidate should defend the thesis by means of a formal thesis defense only after appropriate changes would be introduced in candidate's thesis according to the recommendations of the present report*
☐ *The thesis is not acceptable and I recommend that the candidate be exempt from the formal thesis defense*