Skoltech
Skolkovo Institute of Science and Technology

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Georgii Novikov

PhD Program: Computational and Data Science and Engineering

Title of Thesis: Tensor-train decomposition for efficient data representation and learning

Supervisor: Professor Ivan Oseledets
Co-supervisor: Assistant Professor Maxim Panov

Name of the Reviewer:

I confirm the absence of any conflict of interest (Alternatively, Reviewer can formulate a possible conflict)	**Date: 12-Nov-2024**

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

This thesis presents four major contributions on application of tensor train decomposition to deep learning tasks, including tensor train for density estimation, tensor train for compressing fully-connected layers of large language models, few-bit backward for memory efficiency and tensor train for point cloud compression. The developed techniques and approaches are technically sound and novel, supported by convincing experimental evaluations. The topic is both timely and pertinent. These technical contributions are significant and contribute to advancing the current state-of-art density estimation and model compression, which indicates the potential impact of the research in the tensor and deep learning research community. The thesis is well-structured, clearly presented and the overall quality the dissertation is high.

A minor suggestion is as follows. In the Conclusion part, it would be better to add some descriptions on the potential impact for related applications and the vision on the future research directions.

Provisional Recommendation

☒ *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*