Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Egor Zakharov

PhD Program: Computational and Data Science and Engineering

Title of Thesis: Synthesis of human face and body images via generative adversarial networks

Supervisor: Associate Professor Victor Lempitsky

Name of the Reviewer: Ivan Oseledets

I confirm the absence of any conflict of interest (Alternatively, Reviewer can formulate a possible conflict)	**Date: 10-03-2023**

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

Thesis of Egor Zakharov has 144 pages. It consists of introduction, 7 main chapters and an a conclusion. Egor is an author six papers with 3 as a first authors.

The topic of the thesis Is synthesis of human faces and body images via generative adversarial networks. This has been one of the most challenging tasks in computer graphics. Some of the approaches presented in the thesis have been revolutional at the time they have been proposed, and now they are 'classical' in the sense that most people take them as granted. Such an example is image manipulation with perceptual discriminators: using GAN losses with perceptual losses (combination of a feature extractor and regular discriminator).

For the part developed to texture neural avatars the main challenge is the limited availability of data. A complex neural architecture has been designed.

The paper (and chapter) on few-shot adversarial learning of realistic neural talking head models is very important to the thesis. The problem is stated as conditional image generation with a lot special tricks and techniques, such adaptive instance normalization (AdaIN) for conditioning the generator on arbitrary style.

Next paper is devoted to the speeding up the generation. The solution is to generate a coarse image by a small network (pose-independent) and the next layer generates high-frequency details.

Paper 'Megaportraits…' moves head avatars to megapixel resolution. The paper 'Realistic one shot mesh-based avatars' uses geometry-based rendering.

The novelty of the results (at the time of publishing) is clear, as well as the quality of the obtained results. Most of the approaches solve the same problem: generation of human face. This is indeed a 'engineering' task, but it can only be solved by designing advanced algorithms, architectures and training schemes, and Egor has clearly mastered these.

My main question to the author of the thesis Is more the amount of educational material that it contains. One of the main reasons why people put thesis together (instead of paper) so it collects some knowledge that potentially could be useful for future generation of researchers. This is not obligatory, but it can be useful. However, the field to me looks like more of engineering, and transferring the knowledge 'how to build similar systems' in a systematic way is not present (i.e., a more general concept or technology that has been developed): it looks like olympiad-style problem solving approach, which can only be done by the author itself. The general advices and recipes for using and developing such kind of methods would be a very nice additional to the text.

The comments above do not influence my evaluation of the thesis as 'brilliant'. No doubt, any university could be proud of such results of a PhD student.

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