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Bachelor's Thesis Review

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Title: Face Image Editing in Latent Space of Generative Adversarial Networks
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The thesis experiments on face image editing by modifying latent codes of generative adversarial networks (GAN). The state-of-the-art pretrained StyleGAN by Karras et al. 2019 is used for all experiments. GAN generator transforms a vectorial input, i.e. latent code, into a photorealistic image. It was shown that by manipulating the latent code, an image can be edited. The thesis provides two approaches to the manipulation: (1) the classical method by finding linear directions of semantic attributes, and (2) the proposed method based on iterative optimization. The letter method explicitly maximizes the fitness of the output image to the desired target attributes, including, e.g., facial landmark positions. Both methods are explained in detail. Several experiments are conducted. The experiments compare both methods, elaborate on meta-parameters, and present many results. Finally, as a practical application of the technique, an algorithm that seamlessly inserts a manipulated face into a given photo is provided.

Although the latent space manipulation has been popular recently, the problem is not trivial. The thesis provides a solid insight into the technique. Nela certainly proved her deeper understanding of the matter. In this case, a black-box abstraction of a piece of software would not be enough to propose the method and implement it. Both mathematical understanding, i.e., formulation of the optimization problem, differentiation of the complex loss function, and programming skills to implement the method in PyTorch toolbox using a complicated computational graph composed of several coupled neural networks, were necessary. Nela took the challenges very well and performed several convincing experiments including the final end-to-end pipeline that provides visually appealing results of manipulated photos.

Nela worked on her thesis systematically. We were meeting regularly, usually on a weekly basis. The progress was rather continuous without major difficulties. Nela read scientific papers and I believe she learned a lot on neural networks while working on her thesis. Nela was active and proposed the PyTorch implementation herself as well as some of the experiments.

I believe the presented thesis is an example of a good quality bachelor's thesis, presenting the technical background, the proposed method, and the comprehensive experimental validation. A minor weakness is that the text would benefit from another proofreading.

In summary, I suggest assessing the thesis

A – excellent.

Ing. Jan Čech, Ph.D.
Thesis Advisor