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PhD thesis review Kodým Oldřich

Dear Prof. Dr. Ing. Pavel Zemčık,

I carefully assessed the PhD thesis of Kodým Oldřich entitled „Deep learning for virtual patient-specific skull modelling and reconstruction“. In short, I came to the conclusion that Kodým Oldřich as a scientist and with his PhD thesis meets the requirements leading to a PhD title.

The major contribution of his PhD thesis for the scientific community is the building and public release of a novel skull reconstruction dataset. I especially value that he joined forces with another team generating a similar dataset concurrently. The value of the resulting MICCAI challenge is tremendous for the community. I'd like to point out, that MICCAI is one of the leading conferences when it comes to evaluating their challenges, and organizing a MICCAI challenge is only possible with the highest quality standards.

The main method proposed in the thesis is a combination of a U-Net in a cascaded fashion. In his work, he shows that this strategy outperforms a standard U-Net approach which is a strong and state-of-the-art baseline. The method is scientifically sound and correct to my understanding and the chosen evaluations are detailed and I did not miss any comparison. He carefully chose different measures to assess the quality of the reconstruction and especially the curvature as an aesthetic measure is innovative. The ablation study with the correlation between different measurements is nicely conducted and demonstrates why choosing the right measure is relevant. With the proposed method he also participated in the Autoimplant 2020 challenge and the obtained results are very close to those of the challenge winners.

A critical step in the field of medical image processing and modelling is to make a novel approach work on real world data. Kodým Oldřich went this extra mile and demonstrates promising results on real images which demonstrate clinical relevance of the proposed method.

Kodým Oldřich could publish several papers in high quality conferences/workshops and journals. The thesis brings together his most relevant work and tells a consistent story. The only small thing I could complain about here is that there are some redundant sections. Since this is a result of a strong publication record and does not strongly affect the readability of the thesis I believe this is a minor issue.

- The topic is appropriate to the area and is up-to-date and the proposed method reaches state-of-the-art reconstruction quality.
- The work is original and both the proposed method as well as the publicly released dataset are a valuable contribution for the community.
- The core of the thesis was submitted and accepted at high quality venues with peer-review.
- The publication list and the individual publications indicate outstanding research erudition.
- I would like to emphasize the efforts the candidate did when organizing the MICCAI Autoimplant 2021 challenge and co-releasing the dataset for this challenge. This is an extraordinary effort especially at this level of his career.

My assessment suggests and I would recommend the conferment of a PhD title to Kodým Oldřich.

Best Regards