Feedback on the PhD manuscript “MACHINE LEARNING ENHANCEMENT OF MICRO-CT BASED MICROMECHANICS OF COMPOSITE MATERIALS” by Radmir Karamov

Member of the examination committee: Larissa Gorbatikh

My feedback is fully in line with the main conclusion of the examination committee that both the manuscript and its defense at KU Leuven were of excellent quality. The manuscript will benefit from elaborating on the following points:

1) It is suggested that the developed methods (for CT image processing to microstructure generation) are more efficient in comparison with the state of the art methods thanks to the machine learning capabilities. One can image that this is the case once the tools are “trained”. However, the training takes significant resources and time. Could you please give your objective opinion on the efficiency of the developed tools with the training part included in calculation. In which cases will the new tools be most beneficial and in which case conventional approach may still work very well?
2) Who are the future users of the developed tools (considering their limitations and advantages)?
3) Most composites have some amount voids. What is the potential of the inpainting methodology to the generation of microstructures with fibers and voids at the same time? What about fibers made of different materials and of diameters, like in the case of hybrid composites? How easy or difficult would it be to extend existing tools to these cases?
4) Please provide justification for the use of FEM with embedded elements instead of the standard FEM.

Thank you for the interesting tools and congratulations with the successful pre-defense at KU Leuven. I recommend it for public defence.