Universität Duisburg-Essen • 45117 Essen

UNIVERSITÄT DUISBURG ESSEN

Offen im Denken

STATIK UND DYNAMIK DER FLÄCHENTRAGWERKE

Reference Letter for Mr Amardeep Angalla

I have known Mr Amardeep Angalla since April 2019 when he started working on his Master thesis under my supervision. The topic of his thesis project was “Enhancing the computation of finite element stiffness matrices by using neural networks”. It was the first in a series of recent thesis projects supervised in my group that dealt with applications of machine learning concepts to computational mechanics problems. Mr Angalla completed the Master thesis in March 2020.

Through his work on the thesis project, Mr Angalla has gained a thorough understanding of machine learning concepts in general and of neural networks in particular. At that time, these techniques were not covered in the Master’s degree course “Computational Mechanics”. He started by developing a simple feed-forward neural network with three layers for the prediction of the ideal number of integration points required in the numerical evaluation of static stiffness matrices of arbitrarily distorted finite elements. Having experienced the limitations of such a simple model, he successfully explored the use of the deep learning API Keras. The latter was used to construct more complex neural networks with varying numbers of layers employing a variety of activation functions. In doing so, Mr Amardeep Angalla has demonstrated that he is capable of exploring, understanding, reproducing and extending complex theoretical concepts and derivations and of realising these formulations in program algorithms. Here, Mr Amardeep Angalla has demonstrated good programming skills in Python and Matlab.

Based on our interaction during his Master thesis project, I have come to regard Mr Angalla as a committed student, who demonstrates great interest in programming and computational mechanics. I wish Mr. Amardeep Angalla all the best for his future career.

Sincerely,

Carolin Birk

Prof. Dr.-Ing. habil. Carolin Birk

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