



Karlstad Applied Analysis Seminar (2023)

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Deep Learning for PDE based forward and inverse problems

Abstract

Recent years have witnessed a fast development in deep learning methods for solving differential equations. The general aim of such methods is to use the expressiveness and adaptability of neural networks to get around shortcomings of classical methods, like finite elements, in regard to non-linear problems, parameter studies or multiscale behavior to just name some examples.

I will present the work of our working group at the Center for Industrial Mathematics in this area. We start with a short introduction to different approaches, including physics informed neural networks (PINNs) and DeepONet for operator approximations. Then we have a small overview of the Python library TorchPhysics, a framework, developed in collaboration with the Robert Bosch GmbH, to easily use physics informed deep learning. At the end, I will cover some current applications and studies for inverse problems where these methods were applied.