Structure-preserving and efficient neural networks for scientific machine learning

Organizers: Philipp Horn[1], Veronica Saz Ulibarrena[2], and Barry Koren[3]

[1]Eindhoven University of Technology, Netherlands , p.horn@tue.nl
[2]Leiden University, Netherlands, ulibarrena@strw.leidenuniv.nl
[3]Eindhoven University of Technology, Netherlands , b.koren@tue.nl

Short Description

The term scientific machine learning emerged in recent years and describes the combination of scientific computing and machine learning techniques. Often, standard techniques from other areas of machine learning, like language processing or image recognition, are used for scientific data. However, these methods are not optimized for data from scientific computing applications. As a result, the combination of classical numerical methods with machine learning techniques can lead to many difficulties instead of having symbiotic effects, like preserving the benefits of both approaches (e.g. robustness and speed). The goal of this minisymposium is to discuss how neural networks can be used to improve classical numerical methods and how mathematical or physical knowledge can in turn benefit neural networks for scientific data. One focus will be on specialized neural network topologies enforcing physical constraints inside the neural network itself. These structure-preserving neural networks can have many benefits like stability, robustness and better generalization outside the data.