Technische Universität Braunschweig

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# Certified Machine Learning

## Rigorous A-Posteriori Error Bounds for Physics-Informed Neural Networks


Lecture of

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Webex Meeting:

https://lnk.tu-bs.de/dMHOKW
Meeting number: 2731 249 8271
Passwort: 9TrHcEhN3d7


Quantifying the prediction error in machine learning is commonly analyzed either in a statistical framework or based on generic results on the approximation capabilities of neural networks. On the other hand, rigorous upper bounds on the prediction error for a specific instance of a neural network are not available in the literature. We show that in the context of physics-informed neural networks, standard residual a-posteriori error estimation techniques can be applied to derive such an upper bound. This bound can be computed without knowledge of the true solution only with a priori available knowledge of the properties of the underlying dynamical system governed by a (partial) differential equation. We demonstrate the applicability of the theoretical results on several examples, including a Navier-Stokes equation. This talk is based on joint work with B. Hillebrecht (University of Stuttgart).