Bernoullis Tafelrunde

Graduate Student Seminar

Monday, 4th of October 2021, 12:15-13:00
Seminarraum 00.003, Spiegelgasse 1 and Zoom

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Error analysis for physics informed neural networks

Abstract

In recent years, there has been an explosive increase in popularity in the use of deep learning techniques in scientific computing. The use of neural networks as surrogates for solutions and observables of partial differential equations has led to many advances in different disciplines because of the (relatively) low cost of training and evaluating these neural networks. One particularly promising framework is that of physics informed neural networks (PINNs), as illustrated by many experiments. We present a theoretical investigation of PINNs and provide a rationale for their very successful empirical performance. We obtain explicit error estimates for the neural network approximation of functions of Sobolev regularity in Sobolev norms and we present numerical examples to demonstrate the feasibility of our bounds. Finally, we show that physics informed neural networks can overcome the curse of dimensionality for certain classes of PDEs.