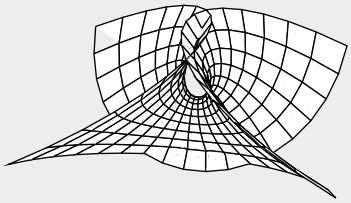

Oberseminar Mathematische Strömungsmechanik

Institut für Mathematik der Julius-Maximilians-Universität Würzburg

Hyperbolic equations - structure preserving methods & other topics

Deep Ray

Univ. of Southern California, USA

A data-driven approach to predict artificial viscosity in high-order solvers

Abstract:

High-order solution methods for hyperbolic conservation laws need to be treated carefully near discontinuities to avoid Gibbs oscillations. In methods which use a local solution description, such as discontinuous-Galerkin schemes, artificial viscosity can be used to smear out spurious oscillations. However, conventional artificial viscosity techniques require the prescription of problem-dependent parameters, which are usually determined empirically. A non-optimal choice of these parameters can lead to the re-appearance of Gibbs oscillations and loss of accuracy in smooth regions.

In this talk, we propose a data-driven approach to overcome this computational bottleneck. In particular, we train artificial neural networks to estimate the amount of viscosity that needs to be added locally. The networks are trained in an offline stage and then used for various conservation laws, without requiring the prescription of any parameters on the users' end. In other words, the performance of the network is agnostic to the underlying conservation law. Furthermore, we demonstrate how such a strategy can be used with schemes using a global solution description, such as Fourier spectral methods.

via Zoom video conference (request the Zoom link from klingen@mathematik.uni-wuerzburg.de)

Friday, April 16 at 3 pm CET

Zu diesem Vortrag sind Sie herzlich eingeladen.

gez. Christian Klingenberg