Karlsruhe Institute of Technology

Seminar of the Work Group
Nonlinear Partial Differential Equations
WS 25/26

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Seminar room: SR 3.069

Computer-assisted Analysis for PDEs on $\mathbb{R}^n$

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Abstract

In this talk I will present a computer-assisted approach for constructively proving the existence of localized solutions in PDEs on $\mathbb{R}^m$. The proof is based on the construction of an approximate solution u_0 with support on a large hypercube using Fourier series, combined with a Newton-Kantorovich approach yielding the existence of a true solution in a vicinity of u_0. Tight Fourier analysis estimates are derived to close the fixed point argument.

Furthermore, we are able to control the spectrum of the linearization around the proven solution. This allows to conclude about spectral (and sometimes nonlinear) (in)stability. Applications to the 2D Swift-Hohenberg PDE, to the 2D Gray Scott model and to the Whitham equation will be presented.