

SEMINAR

Partielle Differentialgleichungen I (BSc. und MSc.).

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The seminar considers tools for the investigation of dissipative partial differential equations. In physics, dissipation occurs during the transformation of energy from one form (often kinetic) into some final form (often heat). Mathematically, these systems are characterized by having a Lyapunov function, which is a monotone function along the evolution of the system. A prototypical example is the heat equation, for which all L^p norms and the entropy act as Lyapunov functions.

The goal of the seminar is to introduce techniques, which allow for qualitative as well as quantitative investigation of the longtime behavior of dissipative systems.

The main topic of the seminar are gradient flow evolutions. These systems are maximal dissipative, in the sense that the evolution follows the gradient of some energy. This type of dynamics was heavily studied in the last 20 years and many techniques and analogies of finite-dimensional systems could be transferred and generalized to partial differential equations of this form. The main tools come from the calculus of variations and the theory of optimal transport. The intuition is led with the help of Riemannian geometry. During the seminar these tools allow for the investigation of a variety of examples as well as to understand current scientific developments.

The seminar topics come from well written research papers as well as book chapters. The seminar is aimed for students of mathematics (Bachelor or Master), which have a background in Analysis (I–III) and partial differential equations. Knowledge of some calculus of variations is helpful, but not requested.

If you are interested please contact me by email.