Oberseminar Nichtlineare Differentialgleichungen

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Singularly perturbed gradient flows in Hilbert spaces

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Abstract: We consider singularly perturbed gradient flows in Hilbert spaces, with a nonconvex and nonsmooth, time-dependent, energy, and address the convergence of their solutions to curves of critical points of the driving energy functional. The degenerating character of the estimates on the gradient-flow curves calls for novel compactness arguments, which we carefully develop by combining tools from the variational approach to Hilbert and metric gradient flows, with fine requirements on the set of critical points of the energy.

This leads us to proving the convergence of the singularly perturbed gradient flows to a **Dissipative Viscosity** solution of the limiting problem, i.e., a curve of critical points satisfying a suitable balance between the energy and a defect-like measure, encoding dissipation. This energy-dissipation balance encompasses information on the dynamics of the process at jumps times, recording, in particular, the re-emergence of viscous behavior.

Under a suitable rectifiability condition on the critical set, we show that Dissipative Viscosity solutions improve to **Balanced Viscosity** solutions, which have key property that the dissipation measure is purely atomic.

Joint work with Virginia Agostiniani (Trento) and Giuseppe Savaré (Milano).

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