Programme du 50^{e} : Méthodes computationnelles rigoureuses et topologiques pour la dynamique en grande dimension
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Validated computation of infinite dimensional stable manifolds in a PDE

Jonathan Jaquette*

jjaquette@brandeis.edu

In this talk we discuss a validated computational method for obtaining error estimates on the infinite dimensional stable manifold of non-trivial equilibria in parabolic PDEs. To construct our approximation, we decompose the stable manifold into three coordinates: a slow part, a fast-but-finite part, and an infinite tail part. We use the parameterization method to approximate the slow-stable manifold, and the associated unstable and fast-but-finite vector bundles. This allows us to define a nonlinear change of coordinates which takes our nonlinear PDE to a system where we have largely removed the nonlinear terms in the slow stable part – effectively widening our spectral gap – and can then apply the Lyapunov-Perron method, obtaining validated error bounds on our approximation. As an example, we apply this technique to the 1D Swift-Hohenberg equation.

*Department of Mathematics - Hill Center, Rutgers, The State University of New Jersey, 110 Frelinghuysen Rd., Piscataway, NJ 08854-8019 , USA