



Lothar-Collatz-Kolloquium über Angewandte Mathematik

Donnerstag, den 07. Mai 2026, um 14:30 Uhr, im Hörsaal 2

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Loss of Hyperbolicity in Complex Systems

Zusammenfassung/Abstract:

Hyperbolicity is one of the cornerstones of applied mathematics as it allows for local linearization. Once hyperbolicity fails, the fully nonlinear problem has to be studied. This paradigm is the key of classical bifurcation theory, which teaches us to always reduce the dynamics to the most simple, often even finite-dimensional, normal form. This reductionist process necessarily discards potentially important information. I shall discuss three cases of more complex systems, where a loss of hyperbolicity can yield additional information. As the main tool to reveal this information, we shall use geometric desingularization. The first case comes from non-autonomous systems (and also applies to stochastic ordinary differential equations), where a hidden delay equation arises. The second case covers adaptive and fast-slow networks, where new graphs arise during desingularization. In the third case, we shall consider multiscale PDEs that generate hidden transport terms near non-hyperbolic solutions. These examples show that the loss of hyperbolicity generates important new challenges in complex systems. The talk is based upon joint work with several co-authors [1, 2, 3, 4, 5, 6].

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References

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