

# Computation of contraction metrics for the stability of dynamical systems

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A contraction metric is a tool to show stability properties of a dynamical system. A contraction metric is a Riemannian metric, with respect to which the distance between adjacent solutions of a dynamical system decreases. Hence, all solutions have the same long-term behavior. A contraction metric can thus be used to prove existence and uniqueness of an equilibrium or a periodic orbit of an autonomous ODE and determine a subset of its basin of attraction without requiring information about its location. Moreover, a contraction metric is robust with respect to small perturbations of the system.

This talk will give an overview of the method and present a converse theorem, showing the existence of a contraction metric satisfying a certain linear partial differential equation (PDE). This leads to a construction method by numerically solving the matrix-valued PDE using mesh-free collocation, which will be applied to several examples.