

Scientific Machine Learning for Dynamical Systems

Peter Benner¹

¹*Max Planck Institute for Dynamics of Complex Technical Systems Sandtorstr. 1, 39106 Magdeburg, Germany*

Abstract

We discuss the problem of inferring governing equations of dynamical systems from (time series) data. We point out connections to the classical model reduction and system identification problems studied in control theory for more than 60 years. The rise of data science and machine learning in the last decade has considerable impact on this field. We discuss here in particular several aspects related to (deep) learning nonlinear manifolds and embeddings for representing nonlinear dynamical systems in state-spaces of reduced dimension and strategies for guaranteeing stability properties of the inferred dynamical systems.
