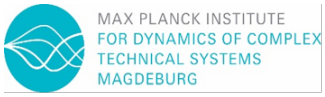

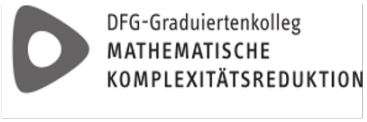

Contribution ID: **12** Type: **Talk**

Generalized Quadratic Embeddings for Nonlinear Dynamical Systems

Thursday, 3 November 2022 14:15 (30 minutes)

Dynamical modeling of a process is essential to study its dynamical behavior and perform engineering studies such as control and optimization. With the ease of accessibility of data, learning models directly from the data have recently drawn much attention. Constructing simple and compact models describing complex nonlinear dynamics is also desirable for efficient engineering studies on modest computer hardware. To achieve our goal, we focus on the lifting principles–that is, sufficiently smooth nonlinear systems can be rewritten as quadratic models in an appropriate coordinate system. Therefore, we focus on identifying suitable coordinate systems such that a quadratic model can describe the dynamics in the obtained coordinate system. To determine such a coordinate system, we leverage the powerful expressive capabilities of deep learning, particularly autoencoders. Moreover, in several physical systems where energy preservation is preserved, we focus on identifying the coordinate systems that can also preserve energy. We illustrate the methodologies to learn the desired coordinate systems for nonlinear dynamical models by illustrative examples.

Primary authors: GOYAL, Pawan (Max Planck Institute for Dynamics of Complex Technical Systems); BENNER, Peter

Presenter: GOYAL, Pawan (Max Planck Institute for Dynamics of Complex Technical Systems)