Introduction to Dynamical Low Rank Approximation.

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Abstract

This talk deals with the concept of dynamical low rank approximation for the matrix case.

Consider a differentiable time-dependent matrix $A(t) \in \mathbb{R}^{m \times n}$ and a matrix differential equation $\dot{A} = F(t, A(t))$. In the common situation where m, n may be very large, a direct approach to find a solution is not feasible and low rank techniques can be used. We discuss a novel approach based on ideas(results) in [1] where the solution is projected on the tangent space of the low-rank manifold. A projector splitting technique is then applied to derive a remarkable numerical integrator [2] and an error-bound estimate [3] is given.

References

[1] Othmar Koch, Christian Lubich, *Dynamical low-rank approximation*, SIAM J. Matrix Anal. Appl. 29 (2007), 434-454.

[2] Christian Lubich, Ivan Oseledets, *A projector-splitting integrator for dynamical low-rank approximation*, BIT 54 (2014), 171-188.

[3] Emil Kieri, Christian Lubich, Hanna Walach, *Discretized dynamical low-rank approximation in the presence of small singular values*, SIAM J. Numer. Anal. 54 (2016), 1020-1038.