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From data to reduced-order models of complex dynamical systems

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Stellingen

behorende bij het proefschrift

From data to reduced-order models of complex dynamical systems

door

Azka Muji Burohman

1. A mathematical model doesn't need to be complicated to be useful.
2. In data-driven reduced-order modeling, the informativity framework enables the preservation of properties that originally belonged to the unknown system that has generated the data. *This thesis*
3. The problem of extracting transfer function moments from time-domain data is as simple as solving a system of linear equations. Thus, the necessary and sufficient conditions for moment matching are in the form of rank conditions of some matrices constructed from the data. *(Chapter 2)*
4. By virtue of the matrix S-lemma, several energy-based model reduction methods, including Lyapunov, bounded real, and positive real balanced truncation, can be performed on noisy data. *(Chapters 3 and 4)*
5. The concept of semidefinite programming duality is convenient to show the existence of the extremal solutions of a linear matrix inequality. In the context of dissipativity theory, it is relevant to the computation of the available storage and required supply functions. *(Chapter 4)*
6. Despite its conservatism, the error bound based on the generalized Gramians approach is handy in guiding the selection of the to-be-truncated nodes in structure-preserving model reduction for network systems via Kron reduction. *(Chapter 5)*
7. "In theory, theory and practice are the same. In practice, they are not".
Albert Einstein
Theoretical results may beautifully solve problems arising from practical applications. However, applying them in practice requires multidisciplinary approaches and tolerating sufficiently small errors.
8. Spend your energy on the right place; Focus on what you can control and observe. *Balanced truncation principle*
9. Do not let perfection be the enemy of productivity. *Unknown origin*