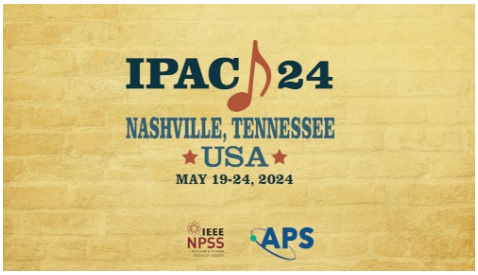

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Koopman operator method for nonlinear dynamics analysis using symplectic neural networks

Monday, 20 May 2024 16:00 (2 hours)

Data driven methods have proved to be a useful tool for analyzing Hamiltonian systems. The symplectic condition is a strong constraint on Hamiltonian systems and it is therefore useful to implement this constraint into neural networks to ensure the accuracy of long term predictions about the system. One such method is the use of SympNets*, linear, activation, and gradient layers that guarantee the symplectic condition is met without the use of symplectic integration or extra gradient calculations. Data driven methods are also useful for calculating Koopman operators which aim to simplify nonlinear dynamical systems into linear ones. By using SympNets, one can ensure that the transformation described by the Koopman operator is symplectic, reversible, and more easily trained.

Footnotes

- Jin, P., Zhu, A., Karniadakis, G. E., & Tang, Y. (2020). Symplectic networks: Intrinsic structure-preserving networks for identifying Hamiltonian systems. CoRR, abs/2001.03750

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