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Learning Symmetries and Conserved Quantities of Physical Systems

Thursday 8 July 2021 09:00 (20 minutes)

This talk is about how we can use ML to identify symmetries (conserved quantities) of physical systems. I report on three different strategies to find symmetries:
1) By examining the embedding a (deep) neural network adapts on a simple supervised task (2003.13679).
2) By imposing a modification to Hamiltonian Neural Networks such that a coordinate transformation ensures the emergence of conserved quantities (symmetry control neural networks, 2104.14444).
3) By searching for a Lax pair/connection to identify whether a system is integrable (2103.07475), i.e. it has as many conserved quantities as degrees of freedom.
I comment on how strategies 1) and 3) enable us to search for new mathematical structures and how 2) can be used to accelerate simulations.

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