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Equations of motions of variational dynamical systems can be derived from an action functional defined by a Lagrangian. When the Lagrangian is not known, it can be identified from dynamical data using machine learning techniques. However, Lagrangians are not uniquely determined by the dynamics. In this talk, I will show a framework to learn symmetric models of Lagrangians. The system's symmetries and conservation laws do not need to be known a priori but are identified automatically based on a Lie group framework. Learning symmetric over non-symmetric Lagrangians improves qualitative aspects of the model, helps the numerical integration of the data-driven model, and informs the user about important geometric properties of the system.

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