

Extracting Dynamical Equations from Experimental Data is NP Hard

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<http://prl.aps.org/abstract/PRL/v108/i12/e120503> [2]

The behavior of any physical system is governed by its underlying dynamical equations. Much of physics is concerned with discovering these dynamical equations and understanding their consequences. In this Letter, we show that, remarkably, identifying the underlying dynamical equation from any amount of experimental data, however precise, is a provably computationally hard problem (it is NP hard), both for classical and quantum mechanical systems. As a by-product of this work, we give complexity-theoretic answers to both the quantum and classical embedding problems, two long-standing open problems in mathematics (the classical problem, in particular, dating back over 70 years).

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