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Data Fitting in Oscillatory and Chaotic Models BEN FRANCIS, MARK TRANSTRUM, Brigham Young University — Nonlinear systems are common in physics, biology, and other fields. These systems often exhibit oscillatory or chaotic behavior. Models of these systems often involve many parameters that must be fit to data, usually by least squares. Finding a good fit is often challenging because the cost function may have many local minima. We show that in many cases the problem is exacerbated by having more data. To alleviate this difficulty, we propose a novel similarity measure of oscillatory behavior based on a kernel density estimate of the system's phase space density. The new cost surface is typically characterized by a single basin. We demonstrate our method on two model: the Fitzhugh-Nagumo model of neuronal spiking and the Lorenz attractor.

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