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Yakov I Berchenko-Kogan* (yashabk@math.mit.edu), Department of Mathematics, MIT, 2-091, 77 Massachusetts Avenue, Cambridge, MA 02139. *Uncovering the Lagrangian from observations of trajectories*. Preliminary report.

Given discrete measurements of trajectories of an unknown dynamical system, we provide a method motivated by variational integrators for automatically modelling the system. We write the discrete Lagrangian as a quadratic polynomial with varying coefficients, and then use the discrete Euler-Lagrange equations to numerically solve for the values of these coefficients near the data points. This method correctly modelled the Lagrangian of a simple harmonic oscillator and a simple pendulum, even with significant measurement noise added to the trajectories. (Received September 21, 2011)