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A common setting across many areas of science and engineering is that one would like to model time series data using some dynamical models. Often a model can be constructed, but the parameters of the model must be chosen according to how well they fit the data. In this talk we survey some of the main approaches to statistical parameter estimation for both deterministic and stochastic models of the dynamics, along with various types of noise. We also discuss some recent joint work with John Harer, Sayan Mukherjee, and Natesh Pillai on designing a database approach to parameter estimation using ideas from Conley Index theory. (Received January 31, 2012)