



Another look at estimating parameters in systems of ordinary differential equations via regularization

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We consider estimation of parameters in systems of ordinary differential equations (ODEs). This problem is important because many processes in various fields of science are modelled by a system of ODEs. Since the system usually contains unknown parameters it is of interest to estimate them. The problem is approached from the viewpoint of M-estimation. In general, for a given parameter the true solution of the system is unavailable, therefore any M-criterion function is necessarily defined via an approximation of the solution. We define an approximation by viewing the system of ODEs as an operator equation and exploiting the connection with the regularization theory. Combining introduced regularized solution with M-criterion function we lay out a general framework for estimating parameters in ODEs which can handle partially observed systems. If M-criterion function is log-likelihood choosing suitable regularized solution yields estimator which is consistent and asymptotically efficient. Connection with the generalized profiling procedure is made.

Keywords: M-estimation; Quasisolution; Generalized Tikhonov regularizer; Asymptotic efficiency.