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Parameter Inference for Differential Equations Using the Kalman Filter

Parameter inference for ordinary differential equations (ODEs) involves the evaluation of the likelihood function for each ODE solution. While this solution is typically approximated by deterministic algorithms, new research indicates that probabilistic solvers produce more reliable estimates by better considerations of numerical errors. A particularly effective probabilistic method, Fenrir, uses Kalman filtering in an efficient manner to obtain the ODE solution. However, it is constrained by the assumption of normally distributed observed data. We extend this method by allowing for observations not necessarily normally distributed. Several examples are used to demonstrate the effectiveness of this approach.