

CORRECTION

Correction: Bayesian parameter estimation for dynamical models in systems biology

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In section 1.6 Constrained interval unscented Kalman filter Markov chain Monte Carlo (CIUKF-MCMC) of the Materials and Methods section, there is an error in Theorem 1. Specifically, in several of the equations in the theorem, some of the indices on x and y in the exponents are incorrect. Please find the correct theorem below;

Theorem 1 (Marginal likelihood (Theorem 1 of [26] and 12.1 of [67])) *Let y_k denote the set of all observations up to time t_k as defined in Section 1.2. Let the initial condition be uncertain with distribution $p(x_0|\theta)$. Then the marginal likelihood is defined recursively in three stages: for $k = 1, 2, \dots$*

1. Predict the new state from previous data

$$p(x_{k+1}|\theta, y_k) = \int_{\mathbb{R}_{\geq 0}^d} p(x_k|\theta, y_k) \frac{\exp(-\frac{1}{2}\|x_{k+1} - \psi(x_k, \theta_f)\|_{\Sigma}^2)}{(2\pi)^{\frac{d}{2}}|\Sigma(\theta_{\Sigma})|^{\frac{1}{2}}} dx_k,$$

2. update the prediction with the current data

$$p(x_{k+1}|\theta, y_{k+1}) = p(x_{k+1}|\theta, y_k) \frac{\exp(-\frac{1}{2}\|y_{k+1} - Hx_{k+1}\|_{\Gamma}^2)}{(2\pi)^{\frac{m}{2}}|\Gamma(\theta_{\Gamma})|^{\frac{1}{2}}},$$

3. and marginalize out uncertainty in the states

$$\mathcal{L}_{k+1}(\theta|y_{k+1}) = \int_{\mathbb{R}_{\geq 0}^d} p(x_{k+1}|\theta, y_k) \frac{\exp(-\frac{1}{2}\|y_{k+1} - Hx_{k+1}\|_{\Gamma}^2)}{(2\pi)^{\frac{m}{2}}|\Gamma(\theta_{\Gamma})|^{\frac{1}{2}}} dx_{k+1}.$$



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Reference

1. Linden NJ, Kramer B, Rangamani P (2022) Bayesian parameter estimation for dynamical models in systems biology. PLoS Comput Biol 18(10): e1010651. <https://doi.org/10.1371/journal.pcbi.1010651> PMID: 36269772