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Online estimation of time-dependent parameters in population models

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Many systems governed by evolutionary parametric partial differential equations involve parameters that evolve in time and must be inferred from partial, noisy observations. Accurately tracking these nonstationary parameters is essential for reliable prediction.
We present a continuous data assimilation framework for time-dependent parameter estimation based on the ensemble Kalman filter. Unknown coefficients are incorporated into an augmented state, enabling their online adaptation as new data become available in a computationally efficient manner.
The approach is illustrated mainly on age-structured epidemiological models, where surveillance data are assimilated to reconstruct evolving mortality and incidence trends.

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