



THE UNIVERSITY OF CHICAGO

Department of Statistics

SCIENTIFIC AND STATISTICAL COMPUTING SEMINAR

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Ergodicity in Data Assimilation Methods

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133 Eckhart Hall, 5734 S. University Avenue

ABSTRACT

The prototypical data assimilation problem has an enormous number of variables that evolve according to a complex and unpredictable dynamical system. The challenge for scientists has been to find computationally efficient methods for sequentially assimilating observed data and models, with the aim of guiding the state predictions towards the observations.

Despite their widespread use, most data assimilation methods remain mechanistically mysterious - there are few guarantees that the dynamical properties of the method will resemble those of the underlying physical model. One might for instance anticipate that a successful data assimilation method will inherit ergodicity from the underlying model, so that if the model is statistically stable to initial perturbations then the method will be similarly stable.

In this talk we will introduce some data assimilation methods that are commonly implemented in geoscience and discuss the above mentioned question of stability. Using the framework of ergodicity for Markov processes, we find sufficient conditions for the inheritance of ergodicity. As a counterpoint, we will construct a simple model that highlights the propensity of data assimilation algorithms to fail spectacularly when it comes to inheritance of ergodicity.

Organizers:

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