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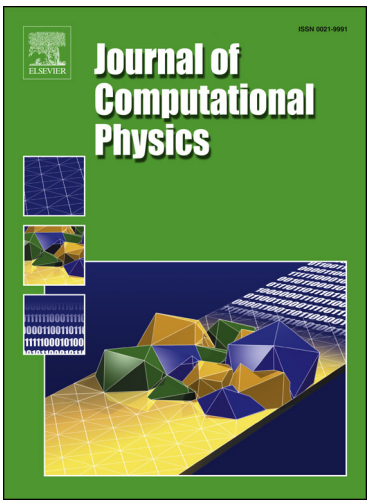


Parallel probabilistic graphical model approach for nonparametric Bayesian inference

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## Highlights

- The new graph-based model approach we proposed and named as PPGM in this paper is powerful enough to provide solutions of two different types of computationally intensive problems in terms of Gaussian mixture.
- One is the Poisson tracking model which is in low dimension, but it is difficult to accurately approximate the true distribution due to its deviation from Gaussian.
- We therefore employ the idea of resampling to effectively suppress the growing complexity that inevitably occurs in the naive PPGM application. Our numerical simulation demonstrates that the improved PPGM can be a competitive framework compared to the existing filters and smoothers in addressing the Poisson tracking model. The other is high dimensional system and we study Lorenz-96 model and parabolic SPDE. In this case, we again drastically improve the performance of PPGM by introducing new family of factor graphs characterized by the variables in smaller dimension, compared to the classical graph, but also by a good degree of overall simplicity despite a vast number of variables. The framework extends our knowledge on the applicability of the graph model approach for Bayesian data assimilation in high dimension.