	doc_1	doc_2	decision	id
cases				

	doc_1	doc_2
authors	S. Yagiz Olmez; Amirhossein Taghvaei; Prashant G. Mehta	S. Y. Olmez; A. Taghvaei; P. Mehta
title	Deep FPF: Gain function approximation in high-dimensional setting	Deep FPF: Gain function approximation in high-dimensional setting
publication_date	2020-10-02 00:00:00	2020-10-02 00:00:00
source	SupportedSources.INTERNET_ARCHIVE	SupportedSources.SEMANTIC_SCHOLAR
journal		
volume		
doi		10.1109/CDC42340.2020.9304260
urls	https://web.archive.org/web/20201009095947/https://arxiv.org/pdf/2010.01183v1.pdf	https://www.semanticscholar.org/paper/feff821dbfeba3e03abb17ae976821bd5a33c373
id	id-7062360908315444288	id8901758427847280178
abstract	In this paper, we present a novel approach to approximate the gain function of the feedback particle filter (FPF). The exact gain function is the solution of a Poisson equation involving a probability-weighted Laplacian. The numerical problem is to approximate the exact gain function using only finitely many particles sampled from the probability distribution. Inspired by the recent success of the deep learning methods, we represent the gain function as a gradient of the output of a neural network. Thereupon considering a certain variational formulation of the Poisson equation, an optimization problem is posed for learning the weights of the neural network. A stochastic gradient algorithm is described for this purpose. The proposed approach has two significant properties/advantages: (i) The stochastic optimization algorithm allows one to process, in parallel, only a batch of samples (particles) ensuring good scaling properties with the number of particles; (ii) The remarkable representation power of neural networks means that the algorithm is potentially applicable and useful to solve high-dimensional problems. We numerically establish these two properties and provide extensive comparison to the existing approaches.	In this paper, we present a novel approach to approximate the gain function of the feedback particle filter (FPF). The exact gain function is the solution of a Poisson equation involving a probability-weighted Laplacian. The numerical problem is to approximate the exact gain function using only finitely many particles sampled from the probability distribution.Inspired by the recent success of the deep learning methods, we represent the gain function as a gradient of the output of a neural network. Thereupon considering a certain variational formulation of the Poisson equation, an optimization problem is posed for learning the weights of the neural network. A stochastic gradient algorithm is described for this purpose.The proposed approach has two significant properties/advantages: (i) The stochastic optimization algorithm allows one to process, in parallel, only a batch of samples (particles) ensuring good scaling properties with the number of particles; (ii) The remarkable representation power of neural networks means that the algorithm is potentially applicable and useful to solve high-dimensional problems. We numerically establish these two properties and provide extensive comparison to the existing approaches.
versions		

decision	id
DUPLICATES	279