accelerated DPVI – only experiment part

Written by AAAI Press Staff[1]*
AAAI Style Contributions by Pater Patel Schneider, Sunil Issar,
J. Scott Penberthy, George Ferguson, Hans Guesgen, Francisco Cruz†**, Marc Pujol-Gonzalez**†
[1]Association for the Advancement of Artificial Intelligence
1900 Embarcadero Road, Suite 101
Palo Alto, California 94303-3310 USA
publications23@aaai.org

Abstract

Experiments part of accelerated DPVI in AAAI-23 template.

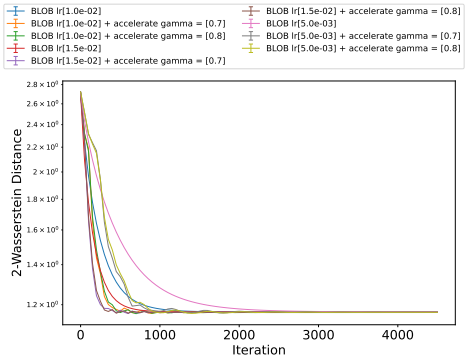
Acceleration Experiments

In this section we conduct empirical studies with our accelerated DPVI algorithms. For each particular algorithm in the DPVI framework i.e. DPVI algorithms (D-GFSD-CA, D-Blob-CA, and D-KSDD-CA), their duplicate/kill variants (D-GFSD-DK, D-Blob-DK, and D-KSDD-DK), and the fixed-weight ParVI algorithms (SVGD, GFSD, Blob and KSDD), we have developed their accelerated variants and verified that they converge faster than their non-accelerated counterpart. Following the convention of sampling community, we conduct empirical studies about acceleration on two synthetic experiments and one real-world application.

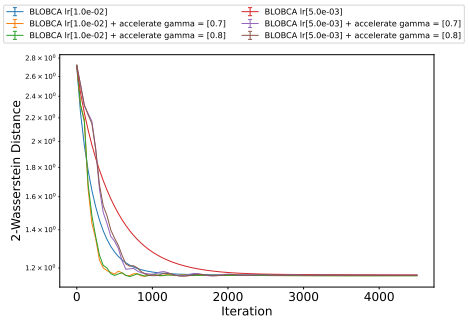
Gaussian Mixture Model

We consider approximating a 10-D Gaussian mixture model with single mode and muti-modes(two components, weighted by 1/3 and 2/3 respectively.) To investigate the faster convergence of accelerated variants of algorithms in the DPVI framework, we evaluated their performance to their non-accelerated counterparts in different hyperparameter settings , by using the 2-Wasserstein (W_2) distance between the empirical distribution generated by each algorithm and the target distribution as a measure of convergence. We generate 5,000 samples from the target distribution π as reference to evaluate the W_2 distance by using the POT library.

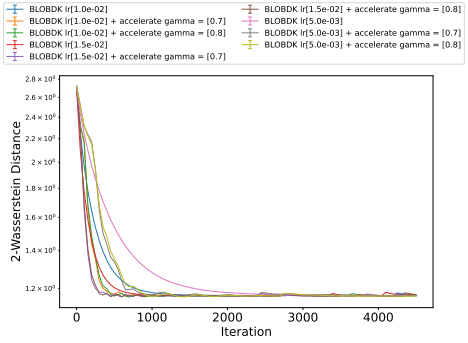
In Figures 1, we plot the W_2 w.r.t iteration of fix weight Blob algorithms, continuous adjust weight Blob algorithms and duplicate/kill Blob algorithms. It can be observed that acceleration technics contribute to faster convergence in both Blob/Blob-CA/Blob-DK algorithms under different step size, fixing acceleration hyperparameter γ to be 0.7 or 0.8.



(a) fix weight



(b) continuous adjust weight



(c) duplicate/kill

Figure 1: W_2 distance to the target w.r.t. iterations

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†These authors contributed equally.