
Algorithm 1 Batched randomized QMC-IPA with jackknifing

Input: batch size m , the number of batches k , quantile α , Sobol sequence x , uniform random number y .

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1: for  $j = 1 \rightarrow k$  do
2:   for  $i = 1 \rightarrow m$  do
3:     Let  $U_i = x_i + y_i \bmod 1$ 
4:     Generate normal variable  $Z_i$  from  $U_i$ 
5:     Let  $h_i = h(Z_i(\theta), \theta)$ 
6:   end for
7:   Divide  $h_i$  into two groups  $h_i^d (d=1,2)$ 
8:   Sort  $h_i, h_i^d (d=1,2)$  to get  $h_{(1)}, h_{(2)}, \dots, h_{(\lceil \alpha m \rceil)}, \dots, h_{(m)}$  and  $h_{(1)}^d, h_{(2)}^d, \dots, h_{(\lceil \alpha m \rceil)}^d, \dots, h_{(\lceil m/2 \rceil)}^d$ 
9:   Let  $\tilde{I}_{m,j} \triangleq dh_{(\lceil \alpha m \rceil)}(\theta)/d\theta$ 
10:  Let  $\tilde{I}_{m,j}^1 \triangleq dh_{(\lceil \alpha m/2 \rceil)}^1(\theta)/d\theta$ 
11:  Let  $\tilde{I}_{m,j}^2 \triangleq dh_{(\lceil \alpha m/2 \rceil)}^2(\theta)/d\theta$ 
12:  Let  $\tilde{J}_{m,j} = 2\tilde{I}_{m,j} - 1/2(\tilde{I}_{m,j}^1 + \tilde{I}_{m,j}^2)$ 
13: end for
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Output: Return the batched randomized QMC-IPA estimator with jackknifing

$$\bar{q}'_{\alpha}(\theta) \triangleq 1/k \sum_{j=1}^k \tilde{J}_{m,j}$$
