

Appendix

Algorithm 1 Streaming Nonlinear Bayesian Tensor Decomposition (SNBTD)

- 1: Initialize $q(\mathcal{U}, \mathcal{S}, \mathbf{w})$ or $q(\mathcal{U}, \mathcal{S}, \mathbf{w}, \tau)$ with the prior.
To avoid being stuck at zero mean, randomly perturb the mean of each s_{mj} , u_{jt}^k and w_j with $0.1\mathcal{N}(\cdot|0, 1)$
 - 2: **while** new entry batch \mathcal{B}_t arrives **do**
 - 3: Use all the data points in \mathcal{B}_t to construct the blending distribution $p_b(\mathcal{U}, \mathcal{S}, \mathbf{w})$ or $p_b(\mathcal{U}, \mathcal{S}, \mathbf{w}, \tau)$.
 - 4: Update $\{q(s_{mj})\}$, $\{q(u_{jt}^k)\}$ and $q(\mathbf{w})$ (and $q(\tau)$ for continuous tensors) in parallel with conditional moment matching coupled with Gauss-Hermite quadrature and Taylor approximations.
 - 5: **end while**
 - 6: **return** The current posterior $q(\cdot)$
-