Probabilistic Streaming Tensor Decomposition with Side Information

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Abstract

Tensor decomposition is an essential tool to analyze high-order interactions in multiway data. While most tensor decomposition approaches are developed for static data, many real-world applications generate tensor elements in a streaming fashion. On the other hand, the side information, such as a variety of the features for the entities and interactions, are produced in the mean time, which can greatly relieve data sparsity and potentially help find factors of better quality. In this thesis, we develop a Bayesian streaming tensor decomposition algorithm that can incrementally update the latent factors with streaming tensor elements in an arbitrary order, and meanwhile integrate the side information to enhance the factor quality. Experiments on four real-world datasets show that our method can improve upon existing streaming decomposition methods that do not exploit side information, and obtain at least comparable prediction accuracy to the stare-of-the-art static tensor decomposition approaches.