1154-68-2274 **Laura Balzano** (girasole@umich.edu), Ann Arbor, MI, **Hanbaek Lyu*** (colourgraph@gmail.com), Los Angeles, CA 90025, and **Deanna Needell** (deanna@math.ucla.edu), Los Angeles, CA 90025. *Online nonnegative matrix factorization for Markovian data.*

Nonnegative matrix factorization (NMF) is one of the fundamental tools in dictionary learning problems, which gives an approximate representation of complex data sets in terms of a reduced number of extracted features. While Markov chain Monte Carlo (MCMC) provides one of the most versatile sampling techniques across many disciplines, most of the online NMF algorithms in the literature assume independence between consecutive data matrices and the case of dependent data sequences remains largely unexplored. In this paper, we show that the well-known online NMF algorithm for i.i.d. stream of data proposed in [MBPS10], in fact converges almost surely to the set of critical points of the expected loss function, even when the data matrices form a Markov chain satisfying a mild mixing condition. Furthermore, we extend the convergence result to the case when we can only approximately solve the optimization problems in the online NMF algorithm. Lastly, we demonstrate that one can learn features from MCMC trajectories arising from spin systems, generative models, and prior distribution on data corpus, which is now theoretically guaranteed by our results. (Received September 17, 2019)