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A new preconditioned stochastic gradient algorithm for estimation in latent variable models

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Latent variable models are powerful tools for modeling complex phenomena involving in particular partially observed data, unobserved variables or underlying complex unknown structures. Inference is often difficult due to the latent structure of the model. To deal with parameter estimation in the presence of latent variables, well-known efficient methods exist, such as gradient-based and EM-type algorithms, but with practical and theoretical limitations. We propose as an alternative for parameter estimation an efficient preconditioned stochastic gradient algorithm. Our method includes a preconditioning step based on a positive definite Fisher information matrix estimate. We prove convergence results for the proposed algorithm under mild assumptions for very general latent variables models. We illustrate through relevant simulations the performance of the proposed methodology in a nonlinear mixed effects model and in a stochastic block model.

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