

Concentration for random matrix products, with applications

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We will survey recent concentration inequalities for products of independent random matrices. Such random matrices naturally appear in the analysis of stochastic and online optimization such as stochastic gradient descent. We illustrate the power of these results with two applications: improved rates of convergence for streaming Principal Component Analysis beyond rank-1 updates, and a proof that minibatch stochastic gradient descent with Polyak momentum achieves the optimal fast linear rate of convergence as in the deterministic setting, provided the minibatch size is above a critical threshold. We conclude by discussing several open problems inspired by applications.