Precise large deviation for products of random matrices

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Résumé

In the case of a sum S_n of independent random variables, Bahadur and Rao and Petrov have established exact large deviation expansions for the probability $P(S_n \geq nq)$ as n goes tp ∞. These milestone results have numerous applications in a variety of problems in pure and applied probability. Consider the product $G_{n}:=g_{n}...g_{1}$, where $(g_{n})_{n \geq 1}$ is a sequence of i.i.d. $d \times d$ real random matrices. The goal is to prove equivalent expansions for the norm $—G_n—$ and for the entries $G_n^{i,j}$. The asymptotics are expressed in terms of the eigenfunctions and invariant measures of the transfer operators related to the Markov chain representation of $\log —G_n—$ and $\log G_n^{i,j}$. In order to prove these results we develop the spectral gap theory for the scalar product of positive matrices. This is a joint work with Ion Grama and Quansheng Liu.

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