Sharp moment comparison for sums of rotationally invariant random vectors and geometric applications

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Abstract

Let $\xi_1, \xi_2, \dots$ be i.i.d. random vectors uniformly distributed on the Euclidean unit sphere S^{d-1} of $\mathbb{R}^d$ and for any $a = (a_1, \dots, a_n) \in \mathbb{R}^n$ let $X_a = \sum_{j=1}^n a_j \xi_j$. What is the infimal value of $\|X_a\|_q$, $-(d-1) < q < 2$, over all $n \in \mathbb{N}$ and unit vectors $a \in \mathbb{R}^n$? We review some well-studied instances of this far-reaching extension of the classical Khinchin inequality, including several recent results and their connection to problems in the geometry of normed spaces.