Self-normalized Gaussian Approximation

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Gaussian approximation is a fundamental tool for studying the asymptotic behavior of functionals of independent random variables, with seminal contributions including Strassen's invariance principle and the Komlós–Major–Tusnády strong approximation. Berry–Esseen-type bounds for Gaussian approximation of standardized sums have been extensively developed under finite moment conditions in low-dimensional settings and under sub-exponential moment conditions in high dimensions. However, because the standardized coefficients such as the population standard deviations are typically unknown, studying high-dimensional Gaussian approximation for self-normalized sums is essential for statistical inference. In this talk, we provide a brief review of self-normalized limit theory and establish a Cramér-type moderate deviation theorem for self-normalized Gaussian approximation under finite moment conditions.