

Colloquium

Connecting Stein's method with Malliavin calculus for normal approximation on infinite-dimensional Gaussian spaces

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摘 要：

Stein's method is a method of probability approximation which hinges on the solution of a functional equation. For normal approximation the functional equation is a first order differential equation. Malliavin calculus is an infinite-dimensional differential calculus whose operators act on functionals of general Gaussian processes. Nourdin and Peccati (Probab. Theory Relat. Fields 145(1–2), 75–118, 2009) established a fundamental connection between Stein's method for normal approximation and Malliavin calculus through integration by parts. This connection is exploited to obtain error bounds in total variation in central limit theorems for functionals of general Gaussian processes. Of particular interest is the fourth moment theorem which provides error bounds of the order $\sqrt{\mathbb{E}(F_n^4) - 3}$ in the central limit theorem for elements $\{F_n\}_{n \geq 1}$ of Wiener chaos of any fixed order such that $\mathbb{E}(F_n^2) = 1$. This talk is an exposition of the work of Nourdin and Peccati.