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An Application of Rice's Formula and Itô-Wiener Expansion: Central Limit Theorem for the Real Roots of a System of Random Multidimensional Polynomials.

Abstract: The now classical change of variable formula for locally bijective smooth functions $F: \mathbb{R}^d \rightarrow \mathbb{R}^d$, that is well known as area formula after the work of Federer, is the basis for obtaining the Rice's formulas for the expectation and the superior order moments of the number of roots for a Gaussian random field. In this talk, we use these Rice's formulas for the first and second moment of the number of roots and also an expansion into the Itô-Wiener chaos for this random variable, to obtain the asymptotic variance and a central limit theorem for the number of roots of a multivariate random Gaussian polynomial system. This is the system known under the acronym KSS (Kostlan-Shub-Smale) the initials of the first researchers who have studied it.