The geometry of the Wilks's Λ random field

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Abstract The statistical problem addressed in this paper is to approximate the P value of the maximum of a smooth random field of Wilks's Λ statistics. So far results are only available for the usual univariate statistics (Z, t, χ^2, F) and a few multivariate statistics (Hotelling's T^2, maximum canonical correlation, Roy's maximum root). We derive results for any differentiable scalar function of two independent Wishart random fields, such as Wilks's Λ random field. We apply our results to a problem in brain shape analysis.

Keywords Multivariate random fields · Excursion sets · Euler characteristic · Derivatives of matrix functions