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Title: Alternative forms of random spherical harmonics

Abstract:

In the last decade, lot of efforts have been devoted to the analysis of the high-frequency behaviour of geometric functionals (Lipschitz-Killing Curvatures) for the excursion sets of random eigenfunctions on the unit sphere (spherical harmonics). In dimension 2, Lipschitz-Killing Curvatures correspond to the area, half of the boundary length and the Euler-Poincaré characteristic. The asymptotic behavior of their expected values and variances have been investigated and quantitative central limit theorems have been established in the high energy limits. In order to find a general theory, these results have been then extended to local behaviour by considering subdomains of the sphere. Another interesting issue concerns the Gaussianity hypothesis of the random field. In this direction we introduce a model of Poisson random waves in S^2 and we study Quantitative Central Limit Theorems when both the rate of the Poisson process and the energy (i.e., frequency) of the waves (eigenfunctions) diverge to infinity. We consider finite-dimensional distributions, harmonic coefficients and convergence in law in functional spaces, and we investigate carefully the interplay between the rates of divergence of eigenvalues and Poisson governing measures.