Statistics for point processes on the d-dimensional unit sphere

We discuss statistical models and methods for the analysis of point patterns on the d-dimensional unit sphere, considering both the isotropic and the anisotropic case, and focusing mostly on the spherical case d=2. Two models are studied in detail: determinantal point processes (based on reference [2]) and log Gaussian Cox processes (based on [1]), which are models for regular and aggregated point patterns, respectively. We review the appealing properties of such processes, including their specific moment properties, density expressions and simulation procedures. We also study reduced Palm distributions and functional summary statistics for general point process models on the unit sphere (see [3]). The results are applied for the description of sky positions of galaxies.

References:

[1] F. Cuevas-Pacheco and J. Møller (2018). Log Gaussian Cox processes on the sphere. Spatial Statistics, 26, 69-82.

[2] J. Møller, M. Nielsen, E. Porcu and E. Rubak (2018). Determinantal point process models on the sphere. Bernoulli, 24, 1171-1201.

[3] J. Møller and E. Rubak (2016). Functional summary statistics on the sphere with an application to determinantal point processes. Spatial Statistics, 18, 4-23.