Summary: We present some properties of a Cauchy family of distributions on the sphere, which is a spherical extension of the wrapped Cauchy family on the circle. The spherical Cauchy family is closed under the Möbius transformations on the sphere and the parameter of the transformed family is expressed using extended Möbius transformations on the compactified Euclidean space. Stereographic projection transforms the spherical Cauchy family into a multivariate $t$-family with a certain degree of freedom on Euclidean space. The Möbius transformations and stereographic projection enable us to obtain some results related to the spherical Cauchy family such as an efficient algorithm for random variate generation, a simple form of pivotal statistic and straightforward calculation of probabilities of a region. A method of moments estimator and an asymptotically efficient estimator are expressed in closed form. Maximum likelihood estimation is also straightforward.

MSC:
- 60E05 Probability distributions: general theory
- 60D05 Geometric probability and stochastic geometry
- 60E10 Characteristic functions; other transforms
- 62E15 Exact distribution theory in statistics

Keywords:
directional statistics; high dimensional data; stereographic projection; von Mises-Fisher distribution; wrapped Cauchy distribution

Full Text: DOI Euclid

References:


[42] Watson, G.

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