Robust Estimation for Circular Data using R

Claudio Agostinelli *
Dipartimento di Statistica
Università Ca' Foscari di Venezia, Italia

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Abstract

In this work we study the problems arising when there are outliers in a data set following a circular distribution.

To obtain robust estimation of the unknown parameters the methods of Weighted Likelihood and Minimum Disparity are used. The methods are defined for a general parametric family of circular data.

We investigate the class of Power Divergence and the related Residual Adjustment Function in order to improve the performance of the introduced methods.

The robust behavior and the performance of Weighted Likelihood and Minimum Disparity are studied for the Von Mises (circular normal) distribution and for the Wrapped Normal distribution. Some computational aspects are illustrated. Two examples based on real data set and the results of a Monte Carlo study are presented.

The implementation and the use in `R` of these robust methods (available in package `wle`) together with plot and print functions (available in package `circular`) is also illustrated.

Keywords: Circular data, Disparity measures, Kernel density estimation, Outliers in circular data, Residual Adjustment Function, Robust estimation, Weighted likelihood.

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*Dipartimento di Statistica, Università Ca' Foscari di Venezia, San Giobbe, Cannaregio 873, 30121 Venezia, Italia, email: claudio@unive.it