BMDS: A Collection of R Functions for Bayesian Multidimensional Scaling

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Abstract

Bayesian MDS has recently attracted a great deal of researchers' attention because (1) it provides a better fit than classical MDS and ALSCAL, (2) it provides estimation errors of the distances, and (3) the Bayesian dimension selection criterion, MDSIC, provides a direct indication of optimal dimensionality; see the original paper by Oh & Raftery (2001). However, Bayesian MDS is not yet widely applied in practice. One of the reasons can be attributed to the apparent lack of software: there is none except for the original Oh & Raftery's code, which requires good experience in Fortran programming and the IMSL library, which is a commercial library for numerical calculation. It may be difficult to require such environment for many researchers.

Considering this situation, we propose a set of R functions, BMDS, to perform Bayesian MDS and to evaluate the results. Using BMDS, researchers can (1) perform Bayesian estimation in MDS, (2) check the convergence of Markov chain Monte Carlo (MCMC) estimation, (3) evaluate the optimal number of dimensions, (4) evaluate the estimation errors and (5) plot the resultant configurations. Also, using BMDS users can comparatively evaluate the result of Bayesian and classical MDS in terms of the value of stress and the plot of observed and estimated distances.

In our functions, we made use of WinBUGS (Spiegelhalter, Thomas, Best, & Lunn, 2007) via R2WinBUGS package (Sturtz, Ligges, & Gelman, 2005) for MCMC estimation. Because the Bayesian MDS model is rather complex and it is impossible to use single WinBUGS script for any model, our bmds() function automatically produces a BUGS script that is adequate for the current data every time we run the R function. By using WinBUGS in this way we can speed-up the MCMC estimation while maintaining the readability of the code, which tends to be complex in Bayesian estimation.

References

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