Statistical hypothesis testing: a new Bayesian Evidence Measure (BDM)

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Abstract In order to check the conformity of a given hypothesis with respect to the available information (prior distribution and data), a large number of statistical analysis methods have been developed. The aim of our work is to construct an index that, in the Bayesian context, takes on the same role that the p-value has in the frequentist framework. The proposed evidence measure, called Bayesian Discrepancy Measure (BDM), see [2], has properties of consistency and invariance. After presenting the BDM and the related Bayesian Discrepancy Test (BDT), we show their properties and their conceptual and interpretative simplicity that allow to easily deal with complex case studies. In particular, we address the use of testing procedures for comparing parameter functions of two independent populations, see [1], which is an issue that is not widely explored in the Bayesian context. Unlike frequentist statistical tests, the advantage of the proposed procedure is that it does not rely on asymptotic assumptions. The computation of the BDM is straightforward when the parameter function involves only a single component of the vector parameter. In contrast, it becomes more difficult when this simplification does not occur and more components are involved, requiring the use of MCMC methods.

References

[1] Bertolino, F., Columbu, S., Manca, M.: A bayesian test for the comparison of two independent populations. SIS 2022 - 51st Scientific Meeting of the italian Statistical Society, Caserta, 22-24 June 2022

[2] Bertolino, F., Manca, M., Musio, M., Racugno, W., Ventura, L.: A new bayesian discrepancy measure (2021). URL https://arxiv.org/abs/2105.13716