A Gibbs Sampler for a Class of Random Convex Polytopes*

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We present a Gibbs sampler for the Dempster-Shafer (DS) approach to statistical inference for Categorical distributions. The DS framework extends the Bayesian approach, allows in particular the use of partial prior information, and yields three-valued uncertainty assessments representing probabilities “for”, “against”, and “don’t know” about formal assertions of interest. The proposed algorithm targets the distribution of a class of random convex polytopes which encapsulate the DS inference. The sampler relies on an equivalence between the iterative constraints of the vertex configuration and the non-negativity of cycles in a fully connected directed graph. Illustrations include the testing of independence in $2 \times 2$ contingency tables and parameter estimation of the linkage model. The paper [1] will appear with discussion in the Journal of the American Statistical Association.

References

[1] Pierre E. Jacob, Ruobin Gong, Paul T. Edlefsen, and Arthur P. Dempster. A gibbs sampler for a class of random convex polytopes (with discussion). Journal of the American Statistical Association, 0(0):1–12, 2021. doi: 10.1080/01621459.2021.1881523. URL https://doi.org/10.1080/01621459.2021.1881523.

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