Bridge sampling: An efficient method to approach inequality constrained hypotheses

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Researchers often approach data analysis of categorical data already expecting certain relations between the probabilities of the categorical events. For example, in replication research researchers seek to confirm whether the data of a replication study show the same trend as the original study (e.g., Verhagen & Wagenmakers, 2014). Researchers might aim to evaluate whether certain psychology journals show a higher prevalence for statistical reporting errors than other journals (Veldkamp et al., 2014), or whether people tend to forget negative life events that lie further in the past (Haberman, 1978).

Researchers are able to adequately capture their expectations and formalize them into testable hypotheses by stipulating ordinal restrictions on the parameters of interest. The Bayesian framework includes several methods to evaluate these hypotheses using Bayes factors, that is, the encompassing prior approach (Klugkist, Kato, & Hoijtink, 2005) or the conditioning method (Mulder et al., 2009). These methods, however, are potentially unstable and time-consuming if the number of categories increases.

In this workshop, I will introduce an accurate and fast alternative for evaluating ordinal constrained hypotheses in categorical data. Our approach is based on the bridge sampling method proposed by Bennet (1976) and Meng and Wong (1996). My goal is to teach you how to implement these methods on the basis of simple statistical models (e.g., the binomial model and the multinomial model). After a general introduction to the three methods, we will formulate ordinal hypotheses and test them on simple data sets. In addition, I will introduce the associated R package **multibridge**, in which we have implemented our bridge sampling method.

Participants in this workshop should have some prior knowledge of programming in R and a basic knowledge of Bayesian inference.