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Hybrid schemes for exact conditional inference in discrete exponential families

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Abstract Exact conditional goodness-of-fit tests for discrete exponential family models can be conducted via Monte Carlo estimation of p values by sampling from the conditional distribution of multiway contingency tables. The two most popular methods for such sampling are Markov chain Monte Carlo (MCMC) and sequential importance sampling (SIS). In this work we consider various ways to hybridize the two schemes and propose one standout strategy as a good general purpose method for conducting inference. The proposed method runs many parallel chains initialized at SIS samples across the fiber. When a Markov basis is unavailable, the proposed scheme uses a lattice basis with intermittent SIS proposals to guarantee irreducibility and asymptotic unbiasedness. The scheme alleviates many of the challenges faced by the MCMC and SIS schemes individually while largely retaining their strengths. It also provides diagnostics that guide and lend credibility to the procedure. Simulations demonstrate the viability of the approach.

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