

Haplotype reconstruction via Bayesian linear models with unknown design

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The topic is the reconstruction of the unknown matrices S and ω for the multivariate linear model $Y = S\omega + \epsilon$ under the assumption of binary entries $s_{ij} \in \{0,1\}$ for S and ω is a weight matrix. While a frequentist method has recently been proposed for this purpose, a Bayesian approach also seems desirable. In contrast to the point estimates provided by this frequentist method, our proposed hierarchical model delivers a posterior that permits quantifying uncertainty. Since matching permutations in both S and ω lead to the same reconstruction $S\omega$, an order-preserving shrinkage prior is introduced to establish identifiability concerning permutations. For inference, a blocked Metropolis-Hastings is introduced within the Gibbs sampling scheme to sample from the hierarchical model enforcing all constraints.