

Robust Bayesian nonparametric clustering across groups

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Room BENVENUTI

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I will consider the problem of clustering across partially exchangeable groups of data. Previously proposed models achieve cross-group clustering by sharing atoms in the group-specific mixing measures. However, exact atom sharing can be overly rigid when groups differ subtly, leading to a trade-off between clustering and density estimation and to the fragmentation of clusters across groups. We introduce a mixture model in which the group-specific mixing measures follow a (normalised) hierarchical shot-noise Cox process (HSNCP), a new prior that we define, based on an “attractive” point process. Our approach departs from traditional BNP models by allowing group-specific mixture distributions to have components that are not necessarily identical, but instead concentrate around shared centers through a kernel. The HSNCP model also introduces a flexible notion of cluster: a cluster corresponds not to a single mixture component, but to an atom of the “mother process”. This framework enables robust cluster estimation across groups, while maintaining accurate density estimation within groups, thereby overcoming the density–clustering trade-off of previous approaches. We present theoretical results on this model. I will also mention an efficient conditional MCMC algorithm for posterior inference and assess the performance of the HSNCP mixture model on simulated and real datasets.



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