SEMINARIO DEL DEPARTAMENTO DE PROBABILIDAD Y ESTADÍSTICA

SEMINARIO DEL DEPARTAMENTO DE PROBABILIDAD Y ESTADÍSTICA-IIMAS-UNAM

José J. Quinlan
Pontificia Universidad Católica de Chile

PARSIMONIOUS HIERARCHICAL MODELING USING REPULSIVE DISTRIBUTIONS

Employing nonparametric methods for density estimation has become routine in Bayesian statistical practice. Models based on discrete nonparametric priors such as Dirichlet Process Mixture (DPM) models are very attractive choices due to their flexibility and tractability. However, a common problem in fitting DPMs or other discrete models to data is that they tend to produce a large number of (sometimes) redundant clusters. In this work we propose a method that produces parsimonious mixture models (i.e. mixtures that discourage the creation of redundant clusters), without sacrificing flexibility or model fit. This method is based on the idea of repulsion, that is, that any two mixture components are encouraged to be well separated. We propose a family of d-dimensional probability densities whose coordinates tend to repel each other in a smooth way. The induced probability measure has a close relation with Gibbs Measures, Graph Theory and Point Processes. We investigate its global properties and explore its use in the context of mixture models for density estimation. Computational techniques are detailed and we illustrate its usefulness with some well-known data sets and a small simulation study.

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