Maximum Likelihood Estimation of a Multidimensional Log-Concave Density

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Abstract: If $X_1, ..., X_n$ are a random sample from a density f in $\mathbb{R}^d$, then with probability one there exists a unique log-concave maximum likelihood estimator $\hat{f}_n$ of f. The use of this estimator is attractive because, unlike kernel density estimation, the estimator is fully automatic, with no smoothing parameters to choose. We exhibit an iterative algorithm for computing the estimator and show how the method can be combined with the EM algorithm to fit finite mixtures of log-concave densities. Applications to classification, clustering, functional estimation and regression problems will be discussed, as well as theoretical results on the performance of the estimator. The talk will be illustrated with pictures from the R package LogConcDEAD.

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