Numerical Analysis and Scientific Computing Seminar

Learning probabilistic graphical models with triangular transport and a Hessian score

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Abstract: Probabilistic graphical models encode the conditional independence properties satisfied by a joint probability distribution. If the distribution is Gaussian, the edges of an undirected graphical model correspond to non-zero entries of the precision matrix. Generalizing this result to continuous non-Gaussian distributions, one can show that an edge exists if and only if an entry of the Hessian of the log density is non-zero (everywhere). But evaluation of the log density requires density estimation: for this, we propose the graph-learning algorithm SING (Sparsity Identification in Non-Gaussian distributions), which uses triangular transport for the density estimation step; this choice is advantageous as triangular maps inherit sparsity from conditional independence in the target distribution. Loosely speaking, the more non-Gaussian the distribution, the more difficult the transport problem. However, for a broad class of non-Gaussian distributions, estimating the Hessian of the log density is much easier than estimating the density itself. In this talk, I'll give examples of graphs that are relatively difficult and surprisingly easy to learn, and provide some theory that justifies the easy cases.

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