Department of Statistics

DISSERTATION PRESENTATION AND DEFENSE

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High-Dimensional Generative Models: Shrinkage, Composition and Autoregression

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ABSTRACT

I will present several approaches for learning high-dimensional distributions from data.

I will start by introducing a hierarchical shrinkage method for large mixture models. The procedure makes use of penalized regressions of the samples onto the path in a hierarchical clustering. In the limit when the number of components is equal to the number of observations, this leads to an adaptive kernel density estimator in which the kernels are not placed at the data points. The approach can be considered as a variant of wavelets on trees (Gavish-Nadler-Coifman '10) applied to the unsupervised setting.

Next, I will discuss the idea of distributed representations. In particular, I will propose a novel composition rule for combining local ``experts" into global models. The proposed model is an alternative to the product of experts model (Hinton '02) and has the advantage of being more successful in disentangling factors of variation in the data.

Lastly, I will consider autoregressive networks based on sparse mixture models and boosting, respectively. The main focus will be on a quantitative comparison with the neural autoregressive distribution estimator (Larochelle-Murray '11) which is a state-of-the-art estimator for high-dimensional distributions.

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