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STATISTICS COLLOQUIUM

MONDAY, FEBRUARY 9, 2015

TALK: 4:15 PM — SCIENCE CENTER RM. 705

RECEPTION: 3:50 PM — SCIENCE CENTER, 7TH FLOOR

“Fast Bayesian Factor Analysis via Automatic Rotations to Sparsity”

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ABSTRACT

Rotational transformations have traditionally played a key role in enhancing the interpretability of factor analysis via post-hoc modifications of the model orientation. Here, we propose a unified Bayesian approach that incorporates factor rotations within the model fitting process, greatly enhancing the effectiveness of sparsity inducing priors. These automatic transformations are embedded within a new PXL-EM algorithm, a Bayesian variant of parameter-expanded EM for fast posterior mode detection. By iterating between soft-thresholding of small factor loadings and transformations of the factor basis, we obtain dramatic accelerations yielding convergence towards better oriented sparse solutions. For accurate recovery and estimation of factor loadings, we propose a spike-and-slab LASSO prior, a two-component refinement of the Laplace prior. Our approach is automatic, because it does not require any pre-specification of the factor dimension. This assumption is avoided by introducing infinitely many factors with the Indian Buffet Process (IBP) prior. The specification of identifiability constraints is also completely avoided. The PXL-EM, made available by the stick-breaking IBP representation, capitalizes on the very fast LASSO implementations and converges quickly. The potential of the proposed procedure is demonstrated on both simulated and real high-dimensional data, which would render posterior simulation impractical. (Joint work with Edward George).