

The University of Chicago Department of Statistics

STATISTICS COLLOQUIUM

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## Learning Low-rank Matrices Under a Flexible Sampling Model

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## ABSTRACT

In the low-rank matrix completion problem, we would like to estimate the entries of an approximately low-rank matrix based on a sparse set of observations. This problem, well-known from the Netflix Prize competition, has many applications including recommender systems, pairwise distance measurement, and image/video sensing and denoising. In the last few years, there have been many theoretical results giving error bounds for low-rank matrix completion by regularizing the matrix trace-norm, primarily in the setting where the observed entries are scattered uniformly across the matrix.

In some applied settings, however, we may be interested in non-uniform sampling for the observed locations, such as Netflix movies with varying popularity levels. In this nonuniform-sampling setting, the weighted trace-norm has been proposed as an alternative to the trace-norm method that takes the non-uniform sampling distribution into account. We give theoretical guarantees for the weighted trace-norm, and show that it is only appropriate in a limited range of settings. We define a new norm, the smoothed weighted trace-norm, and prove that this norm performs well under under any sampling distribution, as well as improving accuracy empirically. (Joint work with Nathan Srebro, Ohad Shamir, and Ruslan Salakhutdinov.)

If time permits, I will also present work on the problem of edge selection in sparse highdimensional graphical models on binary data. In this work, we show that the extended Bayesian information criterion (EBIC) is consistent for model selection in this setting, and is empirically more accurate than cross-validation on weather pattern data. (Joint work with Mathias Drton.)

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