THE UNIVERSITY OF CHICAGO

Department of Statistics

SCIENTIFIC AND STATISTICAL COMPUTING SEMINAR

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Learning Subspaces Online When Data are Missing and Corrupted

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133 Eckhart Hall, 5734 S. University Avenue

ABSTRACT

Low-dimensional linear subspace approximations to high-dimensional data are powerful enough to capture a great deal of structure in many signals, and yet they also offer simplicity and ease of analysis. Because of this they have provided a powerful tool to many areas of engineering and science: problems of estimation, detection and prediction, with applications such as network monitoring, collaborative filtering, object tracking in computer vision, and environmental sensing. We focus on this problem with two constraints: first, our data are streaming, and second, our data may be highly corrupted. Corrupt and missing data are the norm in many massive datasets, not only because of errors and failures in data collection, but because it may be impossible to collect and process all the desired measurements.

In this talk, I will describe results on estimating subspace projections from incomplete data. I will discuss the convergence guarantees and performance of the algorithm GROUSE (Grassmannian Rank-One Update Subspace Estimation), a subspace tracking algorithm that performs incremental gradient descent on the Grassmannian (the manifold of all d-dimensional subspaces for a fixed d) and can handle missing data. Briefly, I'll describe two variants of GROUSE for corrupted data, and then we'll see the application to two problems in computer vision: realtime separation of background and foreground in video and realtime structure from motion.

Organizers:
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