JEAN-PHILIPPE VERT, Mines ParisTech and Institut Curie, Paris, France
Collaborative filtering in Hilbert spaces with spectral regularization

Collaborative Filtering (CF) refers to the task of learning preferences of customers for products, such as books or movies, from a set of known preferences. More formally, this can be seen as the task of filling missing entries in a matrix where some entries are known. A standard approach to CF is to find a low rank approximation to the matrix. This problem is computationally difficult and some authors have proposed recently to search instead for a low trace norm matrix, which results in a convex optimization problem. We generalize this approach to the estimation of a compact operator, of which matrix estimation is a special case. We develop a notion of spectral regularization which captures both rank constraint and trace norm regularization, as well as many others. The major advantage of this approach is that it provides a natural method of utilizing side-information, such as age and gender, about the customers (or objects) in question—a formerly challenging limitation of the low-rank approach. We provide a number of algorithms, and test our results on a standard CF dataset with promising results.

This is a joint work with Jacob Abernethy (UC Berkeley), Francis Bach (INRIA), and Theodoros Evgeniou (INSEAD).