Illinois Center for Wireless Systems

ICWS Seminar Series

WHAT IS POPULAR AMONGST YOUR FRIENDS?

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141 Coordinated Science Lab

Abstract: Collaborative filters are commonly used in e-commerce to recommend relevant content based on available user-item ratings, and recently, several researchers have investigated their performance limits for different data models. One popular approach is to view this as an user-item rating matrix completion problem, and the low-rank matrix model has received particular attention. Our approach (with some relation to the low-rank model) is to view this problem as an estimation of a rearranged "smooth" matrix with unknown rearrangements from noisy observations and missing data. In this talk, I will review our work on this topic, with particular emphasis on the empirical and theoretical performance of a collaborative filter that answers the question: What is popular amongst your friends? While this basic principle seems to be prevalent in many practical implementations, there does not appear to be much theoretical analysis of its performance and we partly fill this gap. We consider probability of an error in an individual recommendation (bit error rate (BER)) as the performance metric. For our data model, we identify three regimes of operation for our algorithm (named Popularity Amongst Friends (PAF)) in the limit as the matrix size grows to infinity. In a regime characterized by large number of samples and small degrees of freedom (defined precisely for our model), the asymptotic BER is zero; in a regime characterized by large number of samples and large degrees of freedom, the asymptotic BER is bounded away from 0 and 1/2 (and is identified exactly except for a special case); and in a regime characterized by a small number of samples, the algorithm fails. We also present numerical results for the MovieLens and Netflix datasets. We discuss the empirical performance in light of our theoretical results and compare with an approach based on low-rank matrix completion.

Biography: Onkar Dabeer got his B.Tech (1996), M.Tech (1998) degrees in EE from IIT Bombay, and his PhD from University of California at San Diego in June 2002. After a postdoc at UCSB and a year at Qualcomm, San Diego, he joined the faculty at the Tata Institute of Fundamental Research, Mumbai in August 2004. His interests are broadly in estimation theory (with current emphasis on problems arising in web, social media, sensor networks) and multi-Gigabit wireless networks. From Dec 2008-Dec 2011, he served on the editorial board of the IEEE Transactions on Wireless Communications and currently he serves on the editorial board of the IEEE Wireless Communications Letters.

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