

数学与系统科学研究院

计算数学所学术报告

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报告题目:

**Alternating Update Procedures for
Unconstrained and Constrained
Binary Matrix Factorization**

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报告时间: **2012 年 6 月 19 日 (周二)**

下午 16: 30-17: 30

报告地点: 科技综合楼三层 **301**

计算数学所小报告厅

Abstract:

In general, binary matrix factorization (BMF) refers to the problem of finding a matrix product of two binary low rank matrices such that the difference between the matrix product and a given binary matrix is minimized. In the current literature on BMF, the matrix product is not required to be binary. We call this unconstrained BMF (UBMF) and similarly constrained BMF (CBMF) if the matrix product is required to be binary. In this paper, we first introduce two specific variants of CBMF and discuss the relationship between BMF and UBMF. Then we propose alternating update procedures for both UBMF and CBMF. In every iteration of the proposed procedure, we solve a specific binary quadratic programming (BQP) problem to update the involved matrix argument. Two different algorithms are presented to cope with the BQP subproblem in the procedure. In particular, we show that the BQP subproblem can be reformulated as a specific clustering problem. Based on the clustering reformulation, we also derive an effective 2-approximation algorithm for CBMF. By exploring the interrelation between UBMF and CBMF, we show that we can obtain good approximation to rank-1 UBMF. The complexity of the proposed algorithms is discussed. Numerical results show that the proposed algorithms for UBMF are able to find better solutions in less CPU time than several other algorithms in the literature, and the solution obtained from CBMF is very close to that of UBMF.

This talk is based on work joint with Peng Jiang and Michael Heath.

欢迎大家参加!