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：

Large-Scale Clustering by Matrix Factorization Models: A Non-convex Penalty Approach

邀请人：刘亚锋 副研究员

报告时间：**2020** 年 **12** 月 **14** 日（周一）

下午 **14:30-15:30**

报告地点：科技综合楼

311 教室

摘要：

The non-negative matrix factorization (NMF) model with an additional orthogonality constraint on one of the factor matrices, called the orthogonal NMF (ONMF), has been found a promising clustering model and can outperform the classical K-means. However, solving the ONMF model is a challenging optimization problem due to the presence of both orthogonality and non-negativity constraints. Most of the existing methods directly deal with the orthogonality constraint in its original form via various optimization techniques. In this paper, we propose a new ONMF based clustering formulation that equivalently transforms the orthogonality constraint into a set of norm-based non-convex equality constraints. To deal with these non-convex equality constraints, we apply a non-convex penalty (NCP) approach to add them to the objective as penalty terms, leaving simple non-negativity constraints only in the penalized problem. One smooth penalty formulation and one non-smooth penalty formulation are respectively studied. We build theoretical conditions for the penalized problems to provide feasible stationary solutions to the ONMF based clustering problem, as well as proposing efficient algorithms for solving the penalized problems of the two NCP methods. Experimental results based on both synthetic and real datasets are presented to show that the proposed NCP methods are computationally time efficient, and either match or outperform the existing K-means and ONMF based methods in terms of the clustering performance.

报告人简介：

张纵辉教授分别于 2003 年与 2008 年自台湾清华大学取得电机工程学士与通讯工程博士学位。目前他任职于香港中文大学(深圳)理工学院与深圳市大数据研究院担任副教授。在 2012 年八月到 2015 年七月期间，他在台湾科技大学电子工程系担任助理教授。在担任教职以前，张教授先后在台湾清华大学(2008-2011)与美国加州大学戴维斯分校(2011-2012)担任博士后研究员。他曾是美国密尼苏达大学双城分校、香港中文大学、美国南加州大学的访问学者。

张教授的研究兴趣主要于通信系统与机器学习中的关键信号处理与优化方法。他在 2014 年获得台湾科技大学年轻学者研究奖，2015 年获得 IEEE 通信学会亚太区杰出年轻学者奖, 2018 年获得 IEEE 信号处理学会最佳论文奖。他曾担任 IEEE TRANSACTIONS ON SIGNAL PROCESSING 与 IEEE TRANSACTIONS ON SIGNAL AND INFORMATION PROCESSING OVER NETWORKS 的编委(Associate editor)。目前，张教授是 IEEE OPEN JOURNAL OF SIGNAL PROCESSING 的编委，他也是 IEEE 信号处理学会通信与网络信号处理技术委员会(IEEE SPS SPCOM TC)的成员。

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