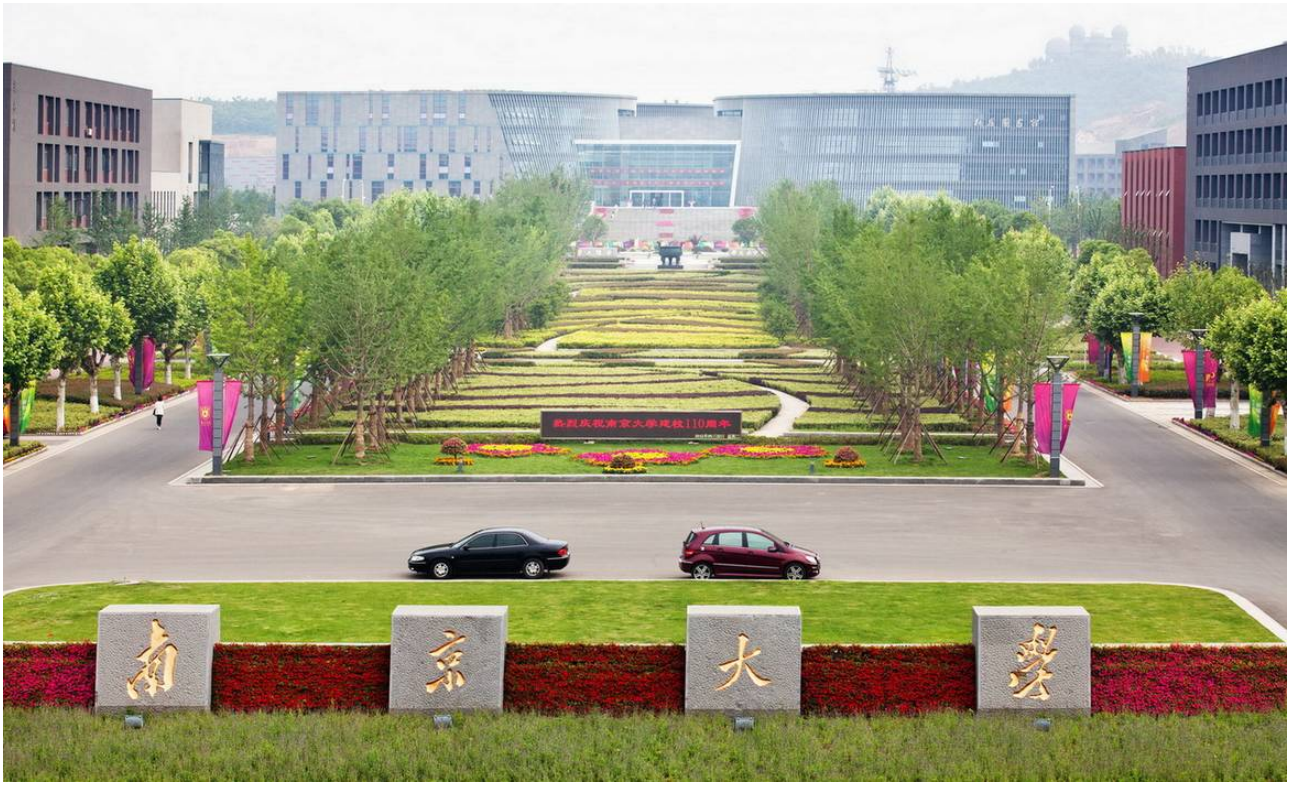
2018 International workshop on Signal Processing, Optimization and Control

2018 年 6 月 21 日 — 23 日

中国, 江苏南京

http://maths.nju.edu.cn/~optim/spoc2018



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为加强国内外信号处理、优化与控制领域青年学者的联系，密切关注国际前沿热点，2018信号处理、优化与控制国际研讨会由南京大学数学系承办，将于2018年6月21日至23日在南京大学仙林校区南大国际会议中心举办。该研讨会为系列会议，2012-2016年先后在中国科学技术大学、哈尔滨工业大学、国防科技大学、中山大学、南开大学陈省身数学研究所举办。本届研讨会由中国科学院刘歆、南京大学杨俊锋、UCLA印卧涛、香港大学袁晓明组织，主题词为优化、人工智能与机器学习，邀请国内外相关领域活跃在第一线的青年科研人员作学术报告。

会议网址：http://maths.nju.edu.cn/~optim/spoc2018

此次会议免注册费，统一安排食宿，费用自理。

南京大学数学系

2018 年 6 月 20 日

注册报到

6 月 21 日 12:00—20:00 在冠军楼酒店注册报到。地址：南京市栖霞区仙林大道169号元化路体育局训练中心转训中心。从地铁站至冠军楼酒店的步行路线见地图，约800米。

6 月 22 日 08:00—08:30 在南大国际会议中心报到注册。

住宿地址

冠军楼大酒店
南大国际会议中心

会议地址

南京大学仙林校区南大国际会议中心（中大报告厅）

就餐地点

南京大学仙林校区教工餐厅

交通

禄口机场：乘地铁S1号线至南京南站，换乘三号线（林场方向）至大行宫站，换乘二号线（经天路方向）至南大仙林校区站

南京南站：乘地铁三号线（林场方向）至大行宫站，换乘二号线（经天路方向）至南大仙林校区站

南京站：乘地铁三号线（秣周东路方向）至大行宫站，换乘二号线（经天路方向）至南大仙林校区站

注1：地铁站至南大国际会议中心的路线：出站后穿过地下通道进入南京大学，再沿着步行路线（见地图）步行约500米。

注2：南京禄口机场距离南大仙林校区约60公里，日间打车约200元。

联系方式

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- 顾国勇： ggu@nju.edu.cn 18994024465
- 陈彩华： chchen@nju.edu.cn 15850511531

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徐薇，南京大学工程管理学院

会议日程

6月21日, 星期四

12:00-20:00 报到注册（地点：冠军楼酒店）

17:00-18:00 晚餐（地点：教工餐厅）

6月22日, 星期五

08:30-09:00 报到注册

09:00-09:10 开幕式（主持人：杨俊锋）

09:10-10:30 主持人：马坚伟

09:10-09:50 **Wotao Yin R-Local Minimum, Global Optimality, and Run-and-Inspect Method**

09:50-10:30 **Zaikun Zhang A Continuous Optimization Model for Clustering**

10:30-11:00 合影、茶歇

11:00-12:20 主持人：印卧涛

11:00-11:40 **Yufeng Li** 安全半监督学习：算法和理论分析初探

11:40-12:20 **Yafeng Liu A New and Enhanced Semidefinite Relaxation for a Class of Nonconvex Complex Quadratic Problems with Applications in Wireless Communications**

12:20-13:30 午餐（教工餐厅）

14:30-16:30 主持人：刘歆

14:30-15:10 **Weihong Guo Non-Negative and Non-Local Tensor Dictionary Learning Based Hyperspectral Image Super-Resolution**

15:10-15:50 **Junchi Li Stochastic Approximation for Feature Extraction: Nonconvex Optimization, Online Learning, and Diffusion Approximation**

15:50-16:30 **Lijun Zhang** 动态环境下的在线学习

16:30-16:50 茶歇

16:50-18:10 主持人：张在坤

16:50-17:30 **Yongjin Liu Efficient sparse Hessian based algorithms for the clustered lasso problem**

17:30-18:10 **Caihua Chen On the Linear Convergence of the ADMM for Regularized Non-Convex Low-Rank Matrix Recovery**

18:30-20:30 晚餐（南大国际会议中心3楼雄芒厅）

6月23日, 星期六

08:30-10:30 主持人：刘亚锋

08:30-09:10 **Yangyang Xu Iteration complexity of inexact Augmented Lagrangian Method**

09:10-09:50 **Ming Yan Primal-dual algorithms for the sum of functions**

09:50-10:30 **Xiangfeng Wang A Fast Proximal Point Method for Wasserstein Distance**

10:30-10:50 茶歇

10:50-12:10 主持人：凌青

10:50-11:30 **Yaohua Liu Communication-Censored ADMM for Decentralized Consensus Optimization**

11:30-12:10 **Wenjie Zhang Deep eXtreme Multi-label Learning**

12:10-13:00 午餐（教工餐厅）

14:30-17:00 自由讨论

17:00-18:00 晚餐（教工餐厅）

报告题目与摘要

On the Linear Convergence of the ADMM for Regularized Non-Convex Low-Rank Matrix Recovery

Caihua Chen
Nanjing University

Abstract: In this paper, we investigate the convergence behavior of an extremely popular first-order method—the alternating direction method of multipliers (ADMM)—for solving regularized non-convex low-rank matrix recovery problems. We show that the ADMM will converge globally to a critical point of the problem without making any assumption on the sequence generated by the method. Furthermore, if the objective function of the problem satisfies the Lojasiewicz inequality with exponent at every (globally) optimal solution, then with suitable initialization, the ADMM will converge linearly to an optimal solution. We then complement this result by showing that three popular formulations of the low-rank matrix recovery problem satisfy the aforementioned Lojasiewicz inequality, which may be of independent interest. Consequently, we are able to exhibit, for the first time, concrete instances of non-convex optimization problems for which the ADMM converges linearly. As a by-product, we establish the global convergence and local linear convergence of the block coordinate descent (BCD) method for solving regularized non-convex matrix factorization problems.

Bio: Caihua is an associate professor in the School of Management and Engineering at Nanjing University. He received his Phd degree in Mathematics from Nanjing University in 2012. His current research interestes lie in the design, analysis and implementaion of algorithms for solving large-scale structured optimization problems, and their applications to mangement science, enigeerning and statistical learning. His publications have appeared on Mathematical Programming, SIAM Journal on Optimization, SIAM Journal on Imaging Sciences, etc.

Non-Negative and Non-Local Tensor Dictionary Learning Based Hyperspectral Image Super-Resolution

Weihong Guo
Case Western Reserve University

Abstract: Hyperspectral images provide rich spectral information that could be used in industry, airborne and remote sensing etc. Hyperspectral sensors achieve high resolution along spectral direction with the price of very low spatial resolution. We provide a hypersepctral image (HIS) super resolution algorithm to increase its spatial resolution by fusing it with a multispectral image (MSI) which is usually available simultaneously during the data collection. Multispectral images have less spectral bands but higher spatial resolution compared with the hyperspectral counter part. We aim at obtaining a high spatial resolution hyperspectral image. We propose a novel non-negative tensor dictionary learning based HSI super-resolution model using non-local spatial similarity and group-block-sparsity. The computation is done on clusters obtained by tensor cube classification. Numerical experiments demonstrate that the proposed model outperforms many state-of-the-art HSI super-resolution methods.

The results are based on collaboration with graduate student Wei Wan and Professors Jun Liu and Haiyang Huang from Beijing Normal University, China.

Bio: Weihong Guo is an Associate Professor in Applied Mathematics at Case Western Reserve University, USA. She received the Ph.D. degree in Applied Math from University of Florida (USA) in 2007. She also received a Master' s degree in Statistics from the same university the same year. Her research interests include image reconstruction and image processing such as image super-resolution, image segmentation, image registration and their applications in medicine, biology, remote sensing, satellite imaging etc. Prof. Guo is an associate editor of the international journal Inverse Problems and Imaging since 2012. She also served as an editor for International Journal of Biomedical Imaging. She has published more than 30 papers in various well-known international journals including SIAM J. Imaging Sciences, Inverse Problems and Imaging, Information Sciences, Journal of Computational and Applied Mathematics, IEEE Transactions on Image Processing, EEE Transactions on Circuits and Systems for Video Technology, Magnetic Resonance Imaging and Magnetic Resonance in Medicine. Prof. Guo has also referred papers for more than 20 international journals and conferences.

Stochastic Approximation for Feature Extraction: Nonconvex Optimization, Online Learning, and Diffusion Approximation

Junchi Li
Princeton University

Abstract: Statistical dimension-reduction and feature-extraction procedures such as Principal Component Analysis (PCA), Independent Component Analysis (ICA), Partial Least Squares (PLS) and Canonical Correlation Analysis (CCA) present significant computational challenges with large-scale data. Online algorithms that updates the estimator by processing streaming data on-the-fly are of tremendous practical and theoretical interests. In this talk, we formulate these statistical procedures as nonconvex statistical optimization problem with nonconvex statistical structures, and view these online algorithm as corresponding stochastic approximation methods. Using standard tools of martingale concentration inequalities, we for the first time obtain the finite-sample error bound of $O(\sqrt{d/N})$. We prove that (i) for PCA, such bound is known to closely match the minimax information lower bound for PCA (L. et al., 2015 Mathematical Programming; L. et al., 2017 NIPS); (ii) for (tensor formulation of) ICA, such bound is consistent with the computational lower bound for spiked tensor model (L., Wang & Liu, 2016 NIPS; L. et al., 2017; Wang, Yang, L. & Liu, 2016); (iii) for PLS and CCA, novel online location-dependent stochastic gradient method is proposed to achieve this bound. Time permitting, we further brief the recent progresses on the diffusion approximation methods for generic first-order algorithms. We show that in the continuous-time framework, first-order stochastic gradient method (Hu & L., 2017+) as well as stochastic heavy-ball method (Hu, L. & Su, 2017+) fastly avoid all saddle points within a time complexity that is inverse proportional to the stepsize.

Bio: Dr. Junchi Li obtained his B.S. in Mathematics and Applied Mathematics at Peking University in 2009, and his Ph.D. in Mathematics at Duke University in 2014. He has since held several research positions, including the role of visiting postdoctoral research associate at Department of Operations Research and Financial Engineering, Princeton University. His research interests include statistical machine learning and optimization, scalable online algorithms for big data analytics, and stochastic dynamics on graphs and social networks. He has published research articles in both top optimization journals and top machine learning conferences, including an oral presentation paper (1.23

安全半监督学习：算法和理论分析初探

Yufeng Li
Nanjing University

Abstract: 对于数据很多，标记很少的问题，半监督学习是这方面数据分析的主流方向，得到了很多的关注和进展。然而，半监督学习技术还不能放心地实施，因为它利用了更多的未标注数据有时反而会恶化性能。因此，发展安全的半监督学习技术，即利用未标注数据在最坏情况下不会恶化性能的技术，成为了一个热点话题。围绕算法设计和理论分析，这次报告介绍我们在安全半监督学习方面取得的若干探索结果。

Bio: 李宇峰，南京大学计算机科学与技术系机器学习与数据挖掘研究所（LAMDA）副研究员，之前在南京大学计算机科学与技术系获学士和博士学位。他主要围绕半监督学习相关方面开展研究，在JMLR、TPAMI、MLJ、ICML、AAAI等领域内重要期刊会议发表论文30余篇。被Google Sholar引用1800余次，篇均引用50余次。近年应邀担任MLJ专刊编委，IJCAI15/17、ACML17高级程序委员，ACML18 workshop co-chair，以及ICML/NIPS/KDD/AAAI 等领域内重要国际会议程序委员20余次。担任中国计算机学会人工智能与模式识别专委会委员、中国人工智能学会机器学习专委会委员、江苏省人工智能学会机器学习专委会秘书长等。获CCF优秀博士论文奖、江苏省优秀博士论文奖，入选CCF首届青年人才发展计划等。

A New and Enhanced Semidefinite Relaxation for a Class of Nonconvex Complex Quadratic Problems with Applications in Wireless Communications

刘亚锋
中国科学院数学与系统科学研究院

Abstract: In this talk, we shall consider a special class of nonconvex Complex Quadratic Problems (CQP), which finds many important and interesting applications in wireless communications. In this talk, we shall first develop a new and Enhanced Complex SemiDefinite Program, called ECSDP, for the considered CQP and then apply the ECSDP to MIMO detection, a fundamental problem in modern wireless communications. As our main result, we show the tightness of the ECSDP for MIMO detection under an easily checkable condition. This result answers an open question posed by So in 2010. Based on the ECSDP, we can also develop a branch-and-bound algorithm for globally solving the MIMO detection problem (even though the above condition does not hold true).

Bio: 刘亚锋，2007年毕业于西安电子科技大学理学院数学系，2012年在中国科学院数学与系统科学研究院获得博士学位（导师：戴彧虹研究员）；博士期间，受中国科学院数学与系统科学研究院资助访问明尼苏达大学罗智泉教授一年。毕业后，他一直在中国科学院数学与系统科学研究院计算数学所工作，现任数学与系统科学研究院副研究员。他的主要研究兴趣是最优化理论与算法及其在信号处理和无线通信等领域中的应用，已在Mathematical Programming, SIAM Journal on Optimization, Mathematics of Operations Research等优化期刊以及IEEE Transactions on Signal Processing, IEEE Journal on Selected Areas in Communications, IEEE Transactions on Wireless Communications, IEEE Transactions on Information Theory等IEEE交叉领域期刊发表论文三十余篇。曾获2010年北京运筹学会“青年优秀科技论文一等奖”，2011 年国际通信大会“最佳论文奖”（由IEEE通信学会颁发），2015年WiOpt (International Symposium on Modeling and Optimization in Mobile, Ad Hoc and Wireless Networks)“最佳学生论文奖”，2018年获数学与系统科学研究院“陈景润未来之星”等。他曾或目前担任《Journal of Global Optimization》和《Journal of Computer Networks and Communications》等期刊的客座编委。他是亚太信号与信息处理学会（Asia-Pacific Signal and Information Processing Association）无线通信和网络（Wireless Communications and Networking）方向的技术委员会成员（Technical Committee）。

Communication-Censored ADMM for Decentralized Consensus Optimization

刘耀华
中国科学技术大学

Abstract: In this work, we devise a communication-efficient decentralized algorithm, called as communication-censored ADMM (COCOA), to solve a convex consensus optimization problem defined over a network. Similar to popular decentralized consensus optimization algorithms such as ADMM (abbreviated for the alternating direction method of multipliers), at every iteration of COCOA, a node exchanges its local variable with neighbors, and then updates its local variable according to the received neighboring variables and its local cost function. A different feature of COCOA is that a node is not allowed to transmit its local variable to neighbors, if this variable is not sufficiently different to the previously transmitted one. The sufficiency of the difference is evaluated by a properly designed censoring function. Though this censoring strategy may slow down the optimization process, it effectively reduces the communication cost. We prove that when the censoring function is properly chosen, COCOA converges to the optimal solution of the convex consensus optimization problem. Further, if the local cost functions are strongly convex, COCOA has a fast linear convergence rate. Numerical experiments demonstrate that, given a target solution accuracy, COCOA is able to significantly reduce the overall communication cost compared to existing algorithms including ADMM, and hence fits for applications where network communication is a bottleneck.

Bio: Yaohua Liu received the B.E. degree in automation from South China University of Technology, Guangzhou, China, in 2015, and currently working toward the Ph.D. degree from the Department of Automation, University of Science and Technology of China, Hefei, China. Her research interest includes distributed large-scale optimization.

Efficient sparse Hessian based algorithms for the clustered lasso problem

刘勇进
福州大学

Abstract: In this talk, we focus on solving the clustered lasso problem, which is a least square problem with the L1-type penalties imposed on both the coefficients and their pairwise differences to learn the group structure of the regression parameters. This work first reformulates the clustered lasso regularizer as a weighted sorted-lasso regularizer, which takes much lower computational cost than the original one. This work then proposes an inexact semismooth Newton augmented Lagrangian (Ssnal) algorithm to solve this equivalent reformulation or its dual depending on whether the sample size is larger than the dimension of the features. Comprehensive results on the global convergence and local convergence rate of the Ssnal algorithm are established. For the purpose of exposition and comparison, this work also summarizes/designs several first-order methods that can be applied to solve the problem under consideration. The numerical experiments show that the Ssnal algorithm substantially outperforms the best alternative algorithms for the clustered lasso problems.[This is a joint work with Meixia Lin, Defeng Sun and Kim-Chuan Toh.]

Bio: 刘勇进，博士，福州大学数学与计算机科学学院教授。2004年毕业于大连理工大学获运筹学与控制论专业博士学位，曾于2007.07-2010.01在新加坡国立大学从事三年半研究工作。研究兴趣主要包括：最优化理论、方法与应用，大规模数值计算，统计优化等，研究成果在Mathematical Programming (Series A)，Computational Optimization and Applications，Journal of Optimization Theory and Applications，Set-Valued and Variational Analysis，Operations Research Letters等优化学术期刊上发表。主持国家自然科学基金2项，主持其他省部级纵向科研项目4项。

A Fast Proximal Point Method for Wasserstein Distance

王祥丰
华东师范大学

Abstract: Wasserstein distance plays increasingly important roles in machine learning, stochastic programming and image processing. Major efforts have been under way to address its high computational complexity, some leading to approximate or regularized variations such as Sinkhorn distance. However, as we will demonstrate, several important machine learning applications call for the computation of exact Wasserstein distance, and regularized variations with small regularization parameter will fail due to numerical stability issues or degradate the performance. We address this challenge by developing an Inexact Proximal point method for Optimal Transport (IPOT) with the proximal operator approximately evaluated at each iteration using projections to the probability simplex. We also simplify the architecture for learning generative models based on optimal transport solution, and generalize the idea of IPOT to a new method for computing Wasserstein barycenter. We provide convergence analysis of IPOT and experiments showing our new methods outperform the state-of-the-art methods in terms of both effectiveness and efficiency.

Bio: Xiangfeng Wang received the B.S. degree in Mathematics and Applied Mathematics from Nanjing University in 2009, and Ph.D. degree in Computational Mathematics also from Nanjing University in 2014. He is now an Assistant Professor at School of Computer Science and Software Engineering, East China Normal University, Shanghai, China. His research interests lie in the areas of large-scale optimization and applications on machine learning.

Iteration complexity of inexact Augmented Lagrangian Method

Yangyang Xu
Rensselaler Polytechnic Institute

Abstract: Augmented Lagrangian method (ALM) has been popularly used for solving constrained optimization problems. Practically, subproblems for updating primal variables in the framework of ALM usually can only be solved inexactly. The convergence and local convergence speed of ALM have been extensively studied. However, the global convergence rate of inexact ALM is still open for problems with nonlinear inequality constraints. In this paper, we work on general convex programs with both equality and inequality constraints. For these problems, we establish the global convergence rate of inexact ALM and estimate its iteration complexity in terms of the number of gradient evaluations to produce a solution with a specified accuracy. We first establish an ergodic convergence rate result of inexact ALM that uses constant penalty parameters or geometrically increasing penalty parameters. Based on the convergence rate result, we apply Nesterov's optimal first-order method on each primal subproblem and estimate the iteration complexity of the inexact ALM. We show that if the objective is convex, then $O(\epsilon^{-1})$ gradient evaluations are sufficient to guarantee an ϵ-optimal solution in terms of both primal objective and feasibility violation. If the objective is strongly convex, the result can be improved to $O(\epsilon^{-\frac{1}{2}}|\log\epsilon|)$. Finally, by relating to the inexact proximal point algorithm, we establish a nonergodic convergence rate result of inexact ALM that uses geometrically increasing penalty parameters. We show that the nonergodic iteration complexity result is in the same order as that for the ergodic result. Numerical experiments on quadratically constrained quadratic programming are conducted to compare the performance of the inexact ALM with different settings.

Bio: 徐扬扬博士现为伦斯勒理工大学数学科学系助理教授。徐扬扬2007年本科毕业于南京大学数学系，2010年获得中国科学院数学与系统科学研究院运筹管理学硕士学位，2014年获得莱斯大学计算与应用数学博士学位。

徐扬扬教授的主要研究方向为最优化理论和算法，高性能平行计算，以及其在压缩感知、信号处理和机器学习方面的应用。对于有复杂约束的非线性规划问题，他独立提出了一系列基于函数一阶信息的原始对偶算法。相比于传统的二阶方法或牛顿法，该类算法只需要非常容易获取的零阶和一阶导函数信息，可以高效地求解大规模优化问题。在超大规模的机器学习问题方面，徐扬扬和印卧涛教授率先提出了块坐标随机梯度下降算法。该算法结合了两类大规模优化方法——块坐标下降方法和随机梯度法，继承了这两类算法的优点，可以充分利用大规模机器学习问题的结构以有效地求解。他在国际著名杂志上发表过逾二十篇文章，在国内国际会议上多次应邀进行报告，并且获得2017年华人数学家最佳论文金奖。

Primal-dual algorithms for the sum of functions

Ming Yan
Michigan State University

Abstract: There are several primal-dual algorithms for minimizing f(x)+g(x)+h(Ax), where f, g, and h are convex functions, f is differentiable with a Lipschitz continuous gradient, and A is a bounded linear operator. In this talk, I will introduce four different primal-dual algorithms for minimizing the sum of three functions and their connections with alternating direction method of multipliers (ADMM). Then I will give some applications in decentralized consensus optimization.

Bio: Ming Yan is an assistant professor in the Department of Computational Mathematics, Science and Engineering (CMSE) and the Department of Mathematics at Michigan State University. His research interests lie in computational optimization and its applications in image processing, machine learning, and other data-science problems. He received his B.S. and M.S in mathematics from University of Science and Technology of China in 2005 and 2008, respectively, and then Ph.D. in mathematics from University of California, Los Angeles in 2012. After completing his PhD, Ming Yan was a Postdoctoral Fellow in the Department of Computational and Applied Mathematics at Rice University from July 2012 to June 2013, and then moved to University of California, Los Angeles as a Postdoctoral Scholar and an Assistant Adjunct Professor from July 2013 to June 2015.

R-Local Minimum, Global Optimality, and Run-and-Inspect Method

Wotao Yin
University of California, Los Angeles

Abstract: Many optimization algorithms provably converge to stationary points. When the underlying problem is nonconvex, those algorithms may get trapped at local minima and stagnate near saddle points. We propose the Run-and-Inspect Method, which adds an "inspection" step to escape from local minima and stationary points that are not globally optimal. The "inspection" step ensures the final point is an approximate "R-local minimizer." We show that an exact R-local minimizer is globally optimal for sufficiently large (but finite) R if the objective function can be implicitly decomposed into a smooth convex function plus a restricted function that is possibly nonconvex, nonsmooth. Our method has a polynomial-time complexity to reach an approximate global minimum. Coupling with gradient descent, coordinate descent, EM, and prox-linear algorithms, the Run-and-Inspect Method worked well on tested nonconvex problems. We show the stochastic approach finds an approximate global minimizer in polynomial time. This is joint work with Yifan Chen (Tsinghua) and Yuejiao Sun (UCLA).

Bio: 印卧涛：加州大学洛杉矶分校（UCLA）数学系教授。2001年7月南京大学数学系本科毕业，2003和2006年分别获得美国哥伦比亚大学工业与运筹系硕士和博士学位。2006至2013年期间任职于赖斯大学（Rice University）应用和计算数学系（Computational and Applied Mathematics）助理教授、副教授。印卧涛的研究集中于数值优化、并行计算、压缩感知、反问题的理论、算法、应用。2008年获得美国自然科学基金CAREER奖，2009年获得美国Sloan Research奖，2016年获得晨兴应用数学奖。印卧涛的研究工作广泛应用于优化、信号处理，通信、机器学习等领域。

动态环境下的在线学习

Lijun Zhang
Nanjing University

Abstract: 在大数据时代，训练数据规模大并且增长快，导致经典的批量式学习计算效率低、不能实时更新。在线学习假设训练数据持续到来，通常利用一个样本更新模型，降低了学习算法的计算复杂度，成为大数据分析的重要技术。传统的在线学习将算法的性能和固定模型比较，以最小化遗憾为目标，无法处理动态环境中存在的模型漂移问题。针对动态环境，我们研究了自适应遗憾和动态遗憾这两种新的优化目标。首先，我们提出了只需要一次梯度查询的在线学习算法，证明了该算法能够最小化自适应遗憾，并支持不同的函数类型。其次，我们从理论上揭示了自适应遗憾和动态遗憾之间的关系，证明了自适应算法能够取得最优的动态遗憾。

Bio: 张利军，博士，南京大学计算机系副教授。主要研究方向为大规模机器学习及优化，在国际学术会议和期刊上发表论文60余篇，包括机器学习顶级会议ICML、NIPS、COLT论文20篇。曾担任CCF-A类会议IJCAI 2017 领域主席，多次担任CCF-A类会议的程序委员会委员或高级委员，以及CCF-A类期刊审稿人。曾获中国科协“青年人才托举工程”、CCF“青年人才发展计划”、南京大学“登峰人才支持计划”、第26届AAAI人工智能国际会议“最佳论文”等荣誉。

Deep eXtreme Multi-label Learning

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Abstract: Extreme multi-label learning (XML) or classification has been a practical and important problem since the boom of big data. The main challenge lies in the exponential label space which involves 2^L possible label sets especially when the label dimension L is huge, e.g., in millions for Wikipedia labels. This paper is motivated to better explore the label space by originally establishing an explicit label graph. In the meanwhile, deep learning has been widely studied and used in various classification problems including multi-label classification, however it has not been properly introduced to XML, where the label space can be as large as in millions. In this paper, we propose a practical deep embedding method for extreme multi-label classification, which harvests the ideas of non-linear embedding and graph priors-based label space modeling simultaneously. Extensive experiments on public datasets for XML show that our method performs competitive against state-of-the-art result.

Bio: Wenjie Zhang is currently working toward the MS degree at School of Computer Science and Software Engineering, East China Normal University, Shanghai, China. His research interests are deep learning and machine learning applications.

A Continuous Optimization Model for Clustering

Zaikun Zhang
The Hong Kong Polytechnic University

Abstract: We study the problem of clustering a set of objects into groups according to a certain measure of similarity among the objects. This is one of the basic problems in data processing with various applications ranging from computer science to social analysis. We propose a new continuous model for this problem, the idea being to seek a balance between maximizing the number of clusters and minimizing the similarity among the objects from distinct clusters. Adopting the spectral clustering methodology, our model quantifies the number of clusters via the rank of a graph Laplacian, and then relaxes rank minimization to trace minimization with orthogonal constraints. We analyze the properties of our model, propose a block coordinate descent algorithm for it, and establish the global convergence of the algorithm. We then demonstrate our model and algorithm by several numerical examples.

This is a joint work with Xin Liu (Chinese Academy of Sciences), Michael Ng (Hong Kong Baptist University), and Rui Zhang (Chinese Academy of Sciences).

Bio: Zaikun Zhang got his PhD in 2012 from Chinese Academy of Sciences. Then he worked as a postdoc at University of Coimbra (Coimbra, Portugal) from 2012 to 2014, and at IRIT-ENSEEIHT (Toulouse, France) from 2014 to 2016. He is now an Assistant Professor at the Department of Applied Mathematics of Hong Kong Polytechnic University. He works on optimization theory and algorithms, and his primary interests include derivative-free methods, randomized methods, and optimization based on inaccurate information.

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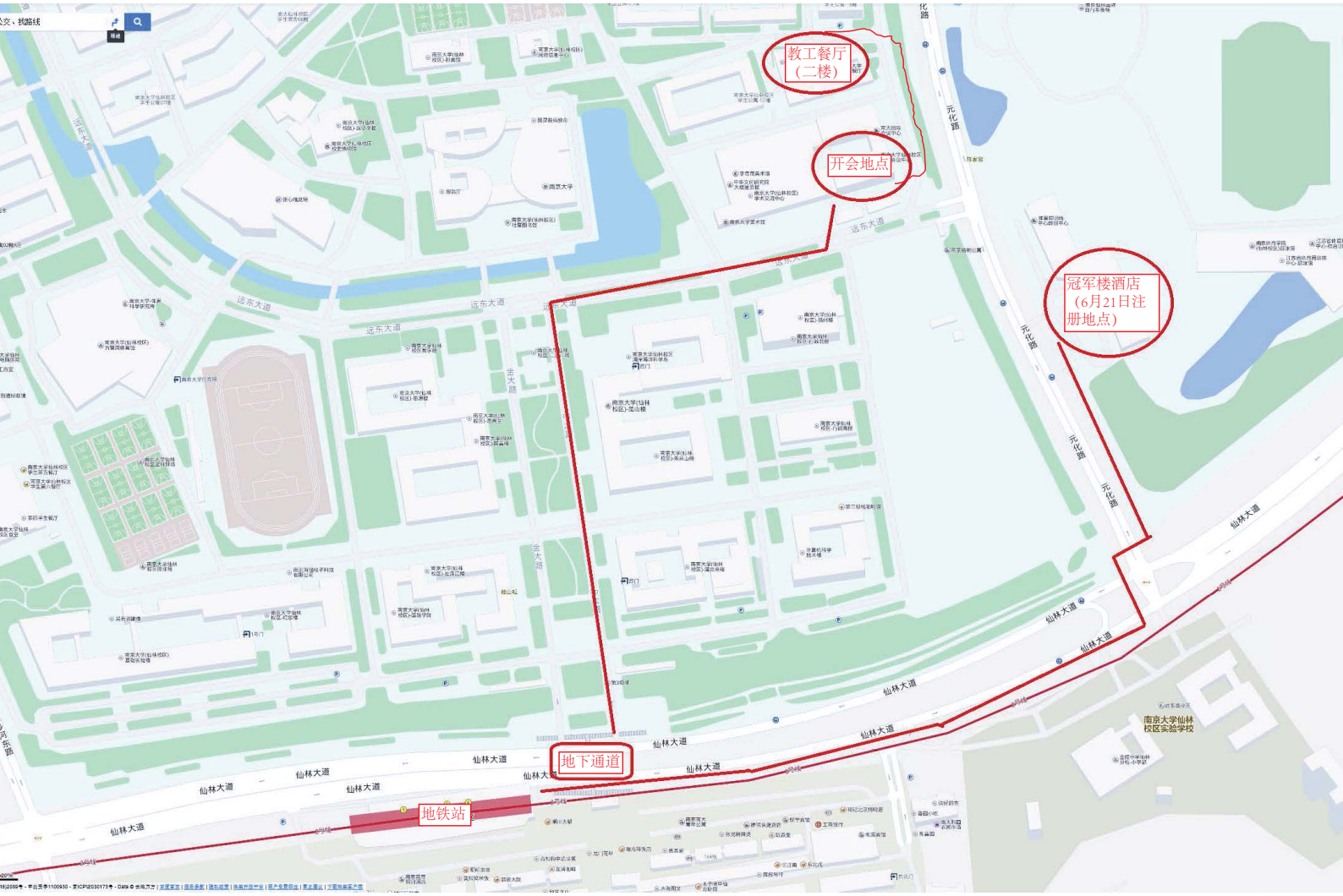
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