

2020 运筹信息论坛

| 邀请报告 1 (11月23日、周一 14:00-17:00) 腾讯会议 ID: 153 211 639 | |
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| 14:00-14:55 主持: 胡晓东 | 赵云彬 深圳大数据研究院 A Brief Introduction to Sparse Optimization: Algorithm Development |
| 15:00-15:55 主持: 张汉勤 | 卢立建 香港科技大学 Framework Agreements in Procurement: An Auction Model and Design Recommendations |
| 16:00-16:55 主持: 陈旭瑾 | 唐与聪 南京航空航天大学 An Information Theory Version of Szemerédi's Regularity Lemmas |
| 邀请报告 2 (11月24日、周二 14:00-17:00) 腾讯会议 ID: 195 338 808 | |
| 14:00-14:55 主持: 闫桂英 | 王维凡 浙江师范大学 Linear Arboricity of Graphs |
| 15:00-15:55 主持: 闫桂英 | 康丽英 上海大学 The Turán Number of Blow-Ups of Graphs |
| 16:00-16:55 主持: 姚大成 | 肖轶 清华大学深圳国际研究生院 On the Role of Supply Information and Inventory for Mitigating Supply Disruption with Capacitated Suppliers |
| 邀请报告 3 (11月25日、周三 9:00-12:00) 腾讯会议 ID: 588 774 272 | |
| 9:00-9:55 主持: 丁超 | 孔令臣 北京交通大学 Outlier Detection via Regularized Huber Regression under Mean Shift Model |
| 10:00-10:55 主持: 丁超 | 陈亮 湖南大学 Symmetric Gauss-Seidel Decomposition Based Proximal ADMMs for Convex Composite Programming: A Unified Algorithmic Framework and Computational Strategies |
| 11:00-11:55 主持: 丁超 | 林媚霞 新加坡国立大学 Adaptive Sieving with PPDNA: Generating Solution Paths of Exclusive Lasso Models |
| 邀请报告 4 (11月25日、周三 14:00-17:00) 腾讯会议 ID: 182 177 438 | |
| 14:00-14:55 主持: 吴凌云 | 程龙 中国科学院自动化研究所 压电陶瓷执行器的智能控制方法 |
| 15:00-15:55 主持: 吴凌云 | 任伟 微软亚洲互联网工程院 Introduction to Conversion Modeling & Auto Bidding in Paid Search Ads |
| 16:00-16:55 主持: 张俊华 | 刘治平 山东大学 Inferring Gene Regulatory Networks from Gene Expression Data |

| 邀请报告 5 (11 月 26 日、周四 9:00-12:00) | |
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| 腾讯会议 ID: 449 618 274 | |
| 9:00-9:55 主持: 张俊华 | 陈兴 中国矿业大学 大数据+人工智能助力疾病早期检测和药物研发 |
| 10:00-10:55 主持: 王勇 | 陈洛南 中国科学院上海生命科学研究院 Autoreservoir Computing for Prediction |
| 11:00-11:55 主持: 王勇 | 任仙文 北京大学 基于单细胞转录组测序数据从头重构细胞空间关系 |
| 邀请报告 6 (11 月 26 日、周四 14:00-17:00) | |
| 腾讯会议 ID: 863 124 579 | |
| 14:00-14:55 主持: 胡晓东 | 邓小铁 北京大学 Game Theory and Practice at the AI Age |
| 15:00-15:55 主持: 胡晓东 | 张国川 浙江大学 Online Algorithms with Imperfect Information |
| 16:00-16:55 主持: 陈旭瑾 | 伏虎 University of British Columbia Linear Program Representations of Bayesian Mechanisms |

A Brief Introduction to Sparse Optimization: Algorithm Development

赵云彬, 深圳大数据研究院

摘要 : Seeking sparsity becomes a common request in variety of scientific and engineering fields. The sparse optimization is fundamentally essential to the modern theory, algorithms and applications of compressive sensing, signal and image processing, statistical learning and so on. This talk will give a brief introduction to sparse optimization, focusing on the algorithm development in data reconstruction/recovery/approximation. Four types of mainstream algorithmic frameworks will be discussed: L1-minimization, nonlinear optimization, hard thresholding and orthogonal matching pursuit as well as their important variants.

报告人简介 : 赵云彬于 2020 年 3 月出任深圳市大数据研究院高级研究科学家。他于 1998 年获中国科学院数学与系统科学研究院运筹与控制论博士学位; 1999-2002 年间分别担任中科院计算数学与科学工程计算, 香港中文大学和加拿大菲尔兹数学研究所博士后研究员; 2001-2010 年在中国科学院数学与系统科学研究院工作; 2007-2020 年在英国伯明翰大学数学学院任教。他长期在应用数学, 运筹学, 计算优化, 信号处理和压缩感知等领域开展研究工作。在稀疏信号处理和压缩感知领域取得了一系列突出成果, 如 RSP 信号重构理论, 凸重构算法的一致稳定性理论, 对偶稠密化方法, 以及最优 Thresholding 高性能算法等。他发表了 60 篇学术论文和 1 本稀疏优化领域的英文专著。他曾担任几个国际数学杂志的编委。

Framework Agreements in Procurement: An Auction Model and Design Recommendations

卢立建, 香港科技大学

摘要： Framework agreements (FAs) are procurement mechanisms commonly used by buying agencies around the world to satisfy demand that arises over a certain time horizon. This paper is one of the first in the literature that provides a formal understanding of FAs, with a particular focus on the cost uncertainty bidders face over the FA time horizon. We generalize standard auction models to include this salient feature of FAs and analyze this model theoretically and numerically. First, we show that FAs are subject to a sort of winner's curse that in equilibrium induces higher expected buying prices relative to running first-price auctions as needs arise. Then, our results provide concrete design recommendations that alleviate this issue and decrease buying prices in FAs, highlighting the importance of (i) monitoring the price charged at the open market by the FA winner to bound the buying price; (ii) implementing price indexes for the random part of suppliers' costs; and (iii) allowing suppliers the flexibility to reduce their prices to compete with the open market throughout the selling horizon. These prescriptions are already being used by the Chilean government procurement agency that buys US\$2 billion worth of contracts yearly using FAs.

报告人简介： Professor Lu is an Assistant Professor at HKUST School of Business and Management. His primary research interests are in the area of data-driven decision-making with a focus on applications in e-commerce, pricing and revenue management, supply chain management, healthcare and service systems, finance-operations interface. His work has been recognized by world leading journals such as Management Science, Manufacturing & Service Operations Management, Mathematics of Operations Research. He is recipient of Finalist of INFORMS George Nicholson Student Paper Competition and Second place of POMS College of Supply Chain Management Student Paper Competition.

Prior to joining HKUST Business School, Professor Lu was Founder and CIO at UniQuant Capital, where he lead quantitative research team and manage 3 billions quantitative long-short hedge funds; Executive Director at China Innovation Fund leading PE/VC investment in TMT area with 150 billions AUM; Vice President at Goldman Sachs Asset Management leading quantitative factor portfolio research and management with 15 billions USD AUM; Research Scientist at Knight Capital Group on high frequency trading, at Amazon.com on e-commerce and logistic optimization, at AppNexus.com on online display advertising market.

An Information Theory Version of Szemerédi's Regularity Lemmas

唐与聪，南京航空航天大学

摘要： Szemerédi's regularity lemma is a basic tool in graph theory, and also plays an important role in additive combinatorics. In this talk, we will introduce a slightly stronger variant of this lemma from the perspective of probability theory and information theory instead of graph theory.

报告人简介： 唐与聪，南京航空航天大学讲师，2016 年博士毕业于中国科学院大学运筹学与控制论专业，研究兴趣：超图的 Hamilton 圈问题，超图极值理论，图神经网络。

Linear Arboricity of Graphs

王维凡，浙江师范大学

摘要： The linear k -arboricity $la_k(G)$ of a graph G is the least integer m such that G can be partitioned into m edge-disjoint forests, whose component trees are paths of length at most k . In this talk, we study the linear k -arboricity of planar graphs, toroidal graphs and 1-planar graphs where $k = 2, \infty$, and present a brief survey on this topic.

报告人简介： 王维凡，浙江师范大学特聘教授，博士生导师。1998 年 7 月于南京大学数学系获得博士学位，1999 年 1 月至 2000 年 12 月在台湾中央研究院数学研究所从事博士后研究。主要从事图的结构、图的染色与标号、图的荫度与分解、网络存活率等方面的研究，主持国家自然科学基金 10 项(其中重点 1 项)、科技部“中法先进研究计划”项目 1 项，发表学术论文 200 余篇，论文被国内外同行引用 1500 余次；获浙江省科学技术奖二等奖 1 项、教育部自然科学奖二等奖 1 项、浙江省自然科学学术奖一等奖 1 项。历任中国数学会理事、中国工业与应用数学会理事、浙江省数学会副理事长、浙江师范大学学术委员会副主任、基础数学-省重点学科负责人、计算机科学与技术-省重中之重学科负责人。现为浙江师范大学数学博士后流动站负责人、数学研究所所长、中国运筹学会图论组合分会理事长、中国数学会组合数学与图论专业委员会常务委员、中国工业与应用数学会图论组合及应用专业委员会常务委员。

The Turán Number of Blow-Ups of Graphs

康丽英，上海大学

摘要： The blow-up of a graph H is the graph obtained from replacing each edge in H by a clique of the same size where the new vertices of the cliques are all different. Given a graph H and a positive integer n , the extremal number, $ex(n, H)$, is the

maximum number of edges in a graph on n vertices that does not contain H as a subgraph. A keyring $C_s(k)$ is a $(k+s)$ -edge graph obtained from a cycle of length k by appending s leaves to one of its vertices. In this talk we determine the extremal number and find the extremal graphs for the blow-ups of keyrings $C_s(k)$ ($k \geq 3, s \geq 1$) when n is sufficiently large. For special cases when $k = 0$ or $s = 0$, the extremal number of the blow-ups of the graph $C_s(0)$ (a star) has been determined by Erdős et al. [Erdős et al., J. Comb. Theory, Ser. B. 64 (1995) 89-100] and Chen et al. [Chen et al., J. Comb. Theory, Ser. B. 89 (2003) 159-171], while the extremal number and extremal graphs for the blow-ups of the graph $C_0(k)$ (a cycle) when n is sufficiently large has been determined by Liu [Liu, Electron. J. Combin. 20 (2013)#P65].

报告人简介：康丽英，上海大学数学系教授，博士生导师。曾获“上海市三八红旗手”，“上海市曙光学者”称号。中国运筹学会常务理事、中国工业与应用数学学会组合图论专业委员会副主任委员、中国数学会组合图论分会理事。担任国际期刊《Discrete Mathematics, Algorithms and Applications》、《Journal of the Operations Research Society of China》、《Communications on Applied Mathematics and Computation》和国内期刊《运筹学学报》编委。在《SIAM Discrete Mathematics》、《Journal of Graph Theory》、《European Journal of Combinatorics》等学术期刊上发表学术论文 140 篇，主持完成 5 项国家自然科学基金项目。曾在美国南卡莱罗纳大学、荷兰蒂尔堡大学、法国巴黎十一大等多所大学进行学术访问和合作研究。

On the Role of Supply Information and Inventory for Mitigating Supply Disruption with Capacitated Suppliers

肖聿，清华大学深圳国际研究生院

摘要： Firms have been increasingly experiencing supply disruptions that can cause them significant losses. In this paper, we study the operational and economic role of inventory and supply information on a firm sourcing from two capacitated suppliers, one of which is susceptible to disruption, over a multi-period planning horizon. Dual sourcing is a widely adopted strategy in practice to mitigate the risk of supply disruption. Although the existing related research abounds, the role of supply information and inventory when suppliers are capacitated seem have not yet been well studied. We formulate and solve the problems using dynamic programming while modeling the state of unreliable supplier and its transition (the supply information) as a finite-state Markov chain. We analyze the structural properties of optimal ordering policies under both dynamic newsvendor and multi-period inventory models, some of which exploit the results from stochastic ordering. In the dynamic newsvendor model where the firm does not carry inventory/demand

backlog between periods, we derive the optimal order quantities from both suppliers in closed-form and discuss their structural properties with respect to the state of unreliable supplier. We further examine how the value of supply information is affected by the suppliers' capacities and provide an analytic upper bound on such value. In the multi-period inventory model where the firm carries inventory/demand backlog, we characterize the optimal ordering policies for the cases with and without supply information. The structural properties of the policy parameters on the state of unreliable supplier and the capacities of the suppliers are analyzed. Numerical studies are used to examine the value of supply information to the firm in both settings and comparative analysis is conducted to discuss the role of inventory. First, optimal ordering policies have different structures with and without supply information. Second, supply disruption could still cause significant losses to the firm even with dual sourcing. Third, the value of supply information is significant to the firm and it is more valuable under dual sourcing than single sourcing. Fourth, carrying inventory/demand backlog can help mitigate the negative impact of supply disruption under dual sourcing but may not be beneficial under single sourcing; and it can sometimes greatly increase the value of supply information. This is a joint work with Sean Zhou (CUHK).

报告人简介： Li Xiao is an assistant professor in Tsinghua Shenzhen International Graduate School, Tsinghua University. She received her BS in information and computing science from Wuhan University, MSc in operations research and cybernetics from Chinese Academy of Science, and PhD in decision science from National University of Singapore. She worked as postdoctoral fellow and research assistant professor in the Chinese University of Hong Kong for two years. Her research interests include supply chain management, service management, and stochastic optimization.

Outlier Detection via Regularized Huber Regression under Mean Shift Model

孔令臣，北京交通大学

摘要： Many high dimensional datasets with hundreds or thousands of covariates suffer from the presence of outliers. The problems of outlier detection in a high dimensional setting are fundamental in statistics and machine learning, and face huge challenges for state-of-the-art methods. In this paper, we consider the problem of linear regression in the presence of outliers. We propose a novel procedure combining Huber loss and convex regularization under the mean shift model to

achieve better estimation and prediction. We derive the risk bounds and exact support recovery for outliers under some mild conditions. Then, we design a novel algorithm combining the alternating minimization method and accelerated proximal gradient method to solve the proposed model. Finally, extensive comparisons on simulation and real dataset demonstrate the efficiency of the proposed procedure.

报告人简介：孔令臣，北京交通大学理学院，教授，博士生导师，中国运筹学会数学规划分会副秘书长。2009年9月入职北京交通大学数学系，2010年晋升为副教授，2014年晋升为教授。主要从事对称锥互补问题、统计优化与学习、医学成像等方面的研究。近年来，在《Mathematical Programming》、《SIAM Journal on Optimization》、《IEEE Transactions on Signal Processing》、《Technometrics》、《Statistica Sinica》等期刊发表论文40余篇。主持国家自然科学基金面上项目“高维聚类的结构矩阵优化理论与算法”、“高维约束矩阵回归的优化理论与算法”、“矩阵秩极小问题的松弛理论与算法研究”和专项基金项目“统计优化与人工智能天元数学交流项目”“机器学习与优化天元数学交流项目”等，参与国家自然科学基金重点项目“大规模稀疏优化问题的理论与算法”以及973课题等。2005年获山东省高等教育教学成果三等奖，2012年获中国运筹学会青年奖，2018年获得北京市高等教育教学成果一等奖。

Symmetric Gauss-Seidel Decomposition Based Proximal ADMMs for Convex Composite Programming: A Unified Algorithmic Framework and Computational Strategies

陈亮，湖南大学

摘要： In this talk, I will first introduce a unified algorithmic framework, which is a fairly accessible generalization of several symmetric Gauss-Seidel decomposition based proximal alternating direction methods of multipliers (ADMMs), for solving convex composite optimization problems. Specifically, the majorized augmented Lagrangian functions, the indefinite proximal terms, the inexact symmetric Gauss-Seidel decomposition theorem, the tolerance criteria of approximately solving the subproblems, and the large dual step-lengths, are all incorporated. Then, I will show that an (inexact) symmetric Gauss-Seidel based majorized multi-block ADMM is equivalent to an inexact proximal augmented Lagrangian method, which not only provides new perspectives for understanding ADMMs but also supplies meaningful guidelines on implementing them. Finally, I will illustrate some numerical strategies that we exploited to tackle the computational burdens that we were confronted with when applying the proposed algorithms to solving the large-scale problems.

报告人简介： 陈亮博士目前是湖南大学数学学院助理教授，信息与计算科学系副主任。他先后于 2009 年和 2016 年在湖南大学数学学院获学士学位和获博士学位，博士在读期间在新加坡国立大学（国家公派）联合培养。2017-2019 年先后在新加坡国立大学数学系和香港理工大学应用数学系进行博士后研究，研究方向是数值最优化。目前已在《Mathematical Programming》、《Mathematical Programming Computation》等优化领域主流期刊发表论文数篇，受国家自然科学基金、湖南省自然科学基金和湖南大学青年教师托举计划专项基金资助，担任湖南省计算数学与应用软件学会理事。

Adaptive Sieving with PPDNA: Generating Solution Paths of Exclusive Lasso Models

林媚霞，新加坡国立大学

摘要： The exclusive lasso (also known as elitist lasso) regularization has become popular recently due to its superior performance on structured sparsity. Its complex nature poses difficulties for the computation of high-dimensional machine learning models involving such a regularizer. In this paper, we propose an adaptive sieving (AS) strategy for generating solution paths of machine learning models with the exclusive lasso regularizer, wherein a sequence of reduced problems with much smaller sizes need to be solved. In order to solve these reduced problems, we propose a highly efficient dual Newton method based proximal point algorithm (PPDNA). As important ingredients, we systematically study the proximal mapping of the weighted exclusive lasso regularizer and the corresponding generalized Jacobian. These results also make popular first-order algorithms for solving exclusive lasso models practical. Various numerical experiments for the exclusive lasso models have demonstrated the effectiveness of the AS strategy for generating solution paths and the superior performance of the PPDNA.

报告人简介： 2016 年毕业于南京大学数学系。同年开始在新加坡国立大学数学系攻读博士（指导老师：孙德锋教授和 Toh Kim-Chuan 教授）。2020 年 10 月获博士学位。其后继续在新加坡国立大学数学系做 Research Fellow（hosted by Prof. Toh Kim-Chuan）。研究方向：大规模复合凸问题的算法设计与研究。

压电陶瓷执行器的智能控制方法

程龙，中国科学院自动化研究所

摘要： 压电陶瓷执行器具有迟滞、蠕变、输入频率相关等非线性特性，实现压电陶瓷执行器的精准控制是纳米级定位的核心技术。我们提出了几种压电陶瓷执行器的智能建模与控制方法，实现了堆叠式压电陶瓷执行器的高精度控制。同时，利用“粘滞-滑动”原理，实现了粘

滑式压电陶瓷执行器的跨尺度控制，取得了较好的实验效果。最后介绍我们在脑切片自动收集装置方面准备开展的工作。

报告人简介：程龙博士，中国科学院自动化研究所研究员，博士生导师，中国科学院大学岗位教授。2004 年于南开大学自动化系获得工学学士学位，2009 年于中国科学院自动化研究所获得工学博士学位。目前已发表 SCI 论文 50 余篇。目前担任《IEEE Transactions on Cybernetics》、《自动化学报》、《控制与决策》、《International Journal of Systems Science》等国内外刊物的编委。入选国家优秀青年基金项目、中组部万人计划青年拔尖人才计划，北京市杰青，中国科学院卓越青年科学家计划、北京市科技新星计划、国际神经网络学会 INNS Aharon Katzir Young Investigator Award 获得者，亚太神经网络 APNNS Young Researcher Award 获得者。获得 2017 年度国家自然科学基金二等奖（排名第四），北京市科学技术一等奖（排名第五），中国自动化学会自然科学一等奖（排名第二）等科技奖励，学术论文获得 IEEE 神经网络汇刊的最佳论文奖以及三个学术会议的最佳论文奖。

Introduction to Conversion Modeling & Auto Bidding in Paid Search Ads

任伟， 微软亚洲互联网工程院

摘要： Advertising has been the main revenue driver for big tech companies like Google and Bing. Traditionally in paid search, advertisers need to specify a list of keywords, each with its bid price for any ads clicks. Ultimately advertisers care more about conversion than clicks, typically they try to achieve conversion goals. Apparently it's very hard to achieve conversion goals by specifying bid price for clicks. Search engines like Google, Bing, Baidu are now offering proxy bidding products in which search engines automatically set up bid price for each ads to achieve your conversion goal. Auto bidding products can in general be formulated as integer programming problem. For this to work, advertisers need to set up conversion tracking in their website. Search engines can use the conversion data to estimate the conversion probability, conversion value and set bid price automatically. In this talk, I will give an overview to problems in conversion modeling, conversion value estimation and conversion attribution.

报告人简介：任伟，2009 年博士毕业于中科院数学与系统科学研究院，研究图论以及复杂网络。毕业后在微软工作至今，现在微软亚洲互联网工程院开发经理。在工作期间对于计算广告中的点击率预测、转化模型预估应用等具有丰富经验，具有深厚的大数据处理的知识和经验，对于算法中常见的工业大规模的深度学习、特征工程、线上服务底层实现等具有深厚了解，深刻理解算法和工程的结合对于广告商业化的巨大促进作用。目前负责微软必应搜索广告中的转化率模型的各项工。

Inferring Gene Regulatory Networks from Gene Expression Data

刘治平，山东大学

摘要： Transcriptional regulation plays vital roles in many fundamental biological processes. Reverse engineering of gene regulatory networks from high-throughput transcriptomic data provides a promising way to characterize the global scenario of regulatory relationships between regulators and their targets. In this talk, we will summarize and categorize the main frameworks and methods currently available for inferring transcriptional regulatory networks from gene expression profiling data. We overview each of strategies and introduce some representative methods respectively.

报告人简介： 刘治平，男，教授，博士生导师，齐鲁青年学者。2008 年获中国科学院数学与系统科学研究院博士学位，曾在美国和日本从事博士后研究工作。2010 年任中国科学院上海生命科学研究院副研究员，2013 年至今任职山东大学。目前主要从事生物信息与机器学习的教研工作，在 Cell, European Heart Journal, Bioinformatics 等国际知名期刊发表论文 60 余篇。

大数据+人工智能助力疾病早期检测和药物研发

陈兴，中国矿业大学

摘要： 我将报告我们团队这些年来在大数据+人工智能助力疾病早期检测和药物研发上的一点研究进展和成果。具体包括大数据+人工智能在以下重要问题上的应用案例：1) 复杂疾病相关非编码 RNA 生物标志物识别；2) 尘肺病早期检测；3) 癌症早期检测和癌症风险评估；4) 药物靶点相互作用预测；5) 抗真菌增效药物组合预测；6) 抗癌增效药物组合预测等内容。

报告人简介： 陈兴，中国矿业大学人工智能研究院副院长，教授、博士生导师（均为 31 岁时直接破格，2016-至今），2019 年科睿唯安全球高被引科学家，2017 年全球排名前十万科学家（排名全球第 12060 位），斯坦福大学发布的世界前 2%科学家，中国矿业大学人工智能研究院大数据研究中心主任，中国矿业大学生物信息研究所所长，中国矿业大学首批越崎学者，江苏省六大人才高峰高层次人才，中国工业与应用数学学会数学生命科学专业委员会秘书长，中国计算机学会生物信息学专业委员会委员，中国人工智能学会青年工作委员会委员，江苏省双创团队核心成员。Journal of Cellular and Molecular Medicine、BMC Bioinformatics、BMC Systems Biology 等四家 SCI 杂志副主编，International Journal of Biological Sciences、Briefings in Functional Genomics、International Journal of Molecular Sciences 等八家 SCI 杂志编委，Frontiers in Microbiology、Current Topics in Medicinal Chemistry 等六家 SCI 杂志首席特约编委，十四家国际生物信息学会议程序委员会成员。以一作或通讯发表 SCI 论文 100 余篇，以一作或通讯在 Bioinformatics、PLoS

Computational Biology、Briefings in Bioinformatics、Nucleic Acids Research 四大生物信息顶级期刊发表论文 21 篇。论文被引共计 7830 次，16 篇论文入选最新一期 ESI 高被引论文，H-因子为 44，单篇最高引为 690。获教育部高等学校科学研究优秀成果奖自然科学奖二等奖（排名第 3）、江苏省科学技术奖三等奖（排名第 1）、中国自动化学会自然科学奖二等奖（排名第 1）、江苏省教育教学与研究成果奖高校自然科学研究类一等奖（排名第 1）、淮海科技英才奖、多个国际会议的最佳论文奖、世界华人数学家大会新世界数学奖等荣誉，主持国家自然科学基金面上项目（2 项）、青年基金、江苏省和中国矿业大学的高层次人才项目等，以主要成员身份参与国家自然科学基金重点项目（2 项，1 项为子课题负责人）、重大研究计划培育项目、数学天元基金、江苏省“双创计划”团队项目等项目。

Autoreservoir Computing for Prediction

陈洛南，中国科学院上海生命科学研究院

摘要： This work develops an auto-reservoir computing framework, Auto-Reservoir Neural Network (ARNN), to efficiently and accurately make multi-step-ahead predictions based on a short term high-dimensional time series. Different from traditional reservoir computing whose reservoir is an external dynamical system irrelevant to the target system, ARNN directly transforms the observed high-dimensional dynamics as its reservoir, which maps the highdimensional/spatial data to the future temporal values of a target variable based on our spatiotemporal information (STI) transformation. Thus, the multi-step prediction of the target variable is achieved in an accurate and computationally efficient manner. ARNN is successfully applied to both representative models and real-world datasets, all of which show satisfactory performance in the multi-step-ahead prediction, even when the data are perturbed by noise and when the system is time-varying. Actually, such ARNN transformation equivalently expands the sample size and thus has great potential in practical applications in artificial intelligence and machine learning.

报告人简介： Luonan Chen received BS degree in the Electrical Engineering, from Huazhong University of Science and Technology, and the M.E. and Ph.D. degrees in the electrical engineering, from Tohoku University, Sendai, Japan, in 1988 and 1991, respectively. From 1997, he was an associate professor of the Osaka Sangyo University, Osaka, Japan, and then a full Professor. Since 2010, he has been a professor and executive director at Key Laboratory of Systems Biology, Shanghai Institute of Biochemistry and Cell Biology, Chinese Academy of Sciences. He was the founding director of Institute of Systems Biology, Shanghai University. He was elected as the founding president of Computational Systems Biology Society of OR China, and Chair of Technical Committee of Systems Biology at IEEE SMC Society. In

recent years, he published over 350 journal papers and two monographs (books) in the area of bioinformatics, nonlinear dynamics and machine learning.

基于单细胞转录组测序数据从头重构细胞空间关系

任仙文, 北京大学

摘要：单细胞转录组测序(scRNA-seq)是一项革命性的生物技术,在生物学中的诸多领域得到了广泛应用。但在组织分离过程中,单个细胞的空间信息会丢失。虽然基于成像的技术如原位测序显示了巨大的前景,但目前的技术挑战限制了它们的广泛应用。在这里,我们提出了名为 CSOmap 的计算工具,可以只基于单细胞转录组测序数据从头重构细胞的空间关系。在人和小鼠的十多个器官的五种单细胞转录组测序平台上,我们对 CSOmap 进行了验证,证明了其有效性。特别地,CSOmap 可以在计算水平上模拟基因或细胞类型的干扰实验,来检验其对细胞空间关系的影响,从而获得新的生物学认识。我们把 CSOmap 用于研究肿瘤微环境,做出了一系列新的发现。

报告人简介：任仙文,副研究员,国家自然科学基金优秀青年项目获得者。2004年毕业于南开大学,获生物学、信息与计算科学双学位;2007年毕业于军事医学科学院,获遗传学硕士学位;2010年毕业于中国科学院数学与系统科学研究院,获得运筹学与控制论博士学位。先后任职于中国医学科学院病原生物学研究所、北京大学生物医学前沿创新中心。致力于单细胞转录组测序的生物信息学分析和肿瘤免疫的研究,针对大规模单细胞测序数据的聚类与注释、单细胞动态行为推断、单细胞空间关系推断、宏转录组数据分析等重要前沿生物信息学问题提出了关键技术创新,在 Cell、Nature、Nature Medicine、Cell Research、Nature Communications 等国际知名杂志上发表论文 50 多篇。

Game Theory and Practice at the AI Age

邓小铁,北京大学

摘要：Game theory played a key role building the conceptual framework social and economic studies at its early stage. With the Internet, millions of participants each with its own motivations at the same platform make incentive analysis and complexity handling the most important challenges. In this talk, we explore the changes we may have to make for the game theory methodology to adapt to the new age of machine intelligence.

报告人简介：Xiaotie Deng is a chair professor of Center on Frontiers of Computing Studies, Peking University. Deng received his BSc from Tsinghua University, MSc from Chinese Academy of Sciences, and PhD from Stanford University. He has taught at Shanghai Jiaotong University of China, the University of Liverpool, City University

of Hong Kong, and York University. He was an NSERC international fellow at Simon Fraser University. Deng's current research focuses on algorithmic game theory with applications to Internet economics. His work covers algorithmic game theory, online algorithms, parallel algorithms, and combinatorial optimization. He is an M.A.E., an ACM Fellow and an IEEE Fellow.

Online Algorithms with Imperfect Information

张国川, 浙江大学

摘要： Online algorithms usually work in the scenarios which only allow irrevocable decisions without future information. Based on the patterns that information is releasing, several basic models have been extensively studied. As the pure online setting is a bit too restrictive, semi-online problems were come up with in late 1990's, in which either partial information is known in advance, or previously made decisions are allowed to change at some degree. This line of research helps understand what and how much information are a must to achieve a desired competitive ratio. However, the semi-online models are somewhat less relevant to the real-world applications. As big data coming with learning techniques, it seems doable to learn something about future when we deal with an online problem, while the information may not be reliable. In this talk, I will briefly introduce a couple of classical online problems and revisit them with imperfect information.

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Linear Program Representations of Bayesian Mechanisms

伏虎, University of British Columbia

摘要： Border proposed in the 1990s succinct representations of Bayesian auctions in terms of interim allocation rules, describing each agent's allocation in expectation over the other agents' types, as in contrast with ex post allocations, which prescribe each agent's allocation given the other agents' types. Border gave necessary and sufficient conditions for feasible interim allocations. In the past decade, fast algorithms were found that optimize over these exponentially many constraints and

realize any feasible interim allocation rule by ex post allocations. These algorithms enable computationally efficient search for optimal Bayesian mechanisms that go far beyond classical results.

In this talk, we describe this development, and give, for single item auctions, a polynomial-sized projection representation of Border's constraints. The latter makes it practical (in addition to being computationally feasible) to optimize over Bayesian mechanisms for a single item. We conclude with discussion on the possibility of generalizing such representations.

报告人简介： Hu Fu is Assistant Professor in the Department of Computer Science at the University of British Columbia. He obtained his PhD from Cornell University, supervised by Bobby Kleinberg. Prior to UBC, he was postdoc at Microsoft Research New England Lab and at Caltech. His research is in the intersection between algorithms and micro economics.