中国运筹学会数学规划分会
第十五届全国数学优化学术会议

上海

2025 年 5 月 16 - 19 日

主办：中国运筹学会数学规划分会

承办：上海工程技术大学

协办：上海市运筹学会

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一、会议宗旨

为加强全国数学优化研究者之间的联系，交流优化理论、算法和应用方面的最新成果，了解数学优化的国际发展动态和研究热点，促进数学优化和工业工程、人工智能与机器学习等领域的融通共进，中国运筹学会数学规划分会第十五届全国数学优化学术会议（MOS2025）将于 2025 年 5 月 16 - 19 日在上海召开。会议由中国运筹学会数学规划分会主办，上海工程技术大学承办，上海市运筹学会协办。MOS2025 将就数学优化各分支的理论、方法、应用和教学等进行学术报告与交流。

二、会议主题

交流最优化理论、算法及其应用的最新成果。议题包括（但不局限于）：线性与非线性规划、锥优化、全局优化、变分不等式与互补问题、组合优化、整数规划、网络优化、博弈论、向量与集值优化、非光滑优化、动态规划、不确定性优化、金融优化、通信中的优化、管理中的优化、统计中的优化、工程中的优化、人工智能与机器学习中的优化等。

三、顾问委员会（按照姓氏汉语拼音排序）

堵丁柱（University of Texas at Dallas）
罗智泉（香港中文大学（深圳））
袁亚湘（中科院数学院）
韩继业（中科院数学院）
叶荫宇（Stanford University/香港中文大学）

四、学术委员会

主任：修乃华（北京交通大学）
委员：（按照姓氏汉语拼音排序）

白延琴（上海大学）
陈小君（香港理工大学）
戴彧虹（中科院数学院）
凌　晨（杭州电子科技大学）
孙德锋（香港理工大学）
修乃华（北京交通大学）
张国川（浙江大学）
陈光亭（浙江水利水电学院）
陈旭瑾（中科院数学院）
郭田德（中国科学院大学）
鲁习文（华东理工大学）
邢文训（清华大学）
徐大川（北京工业大学）
张立卫（大连理工大学）

五、程序委员会

主任：孔令臣（北京交通大学）
副主任：（按照姓氏汉语拼音排序）

范金燕（上海交通大学）
刘　歆（中科院数学院）
文再文（北京大学）
简金宝（广西民族大学）
苏文藻（香港中文大学）
张　昭（浙江师范大学）

委员：（按照姓氏汉语拼音排序）

白敏茹（湖南大学）　　蔡邢菊（南京师范大学）
丁　超（中科院数学院）　　范金燕（上海交通大学）
韩丛英（中国科学院大学）　　何斯迈（上海交通大学）
黄正海（天津大学）　　简金宝（广西民族大学）
蒋建林（南京航空航天大学）　　孔令臣（北京交通大学）
刘　歆（中科院数学院）　　刘勇进（福州大学）
罗和治（浙江理工大学）　　吕锡亮（武汉大学）
彭定涛（贵州大学）　　屈　彪（曲阜师范大学）
苏文藻（香港中文大学）　　谈之奕（浙江大学）
王　磊（大连理工大学）　　文再文（北京大学）
吴晨晨（天津理工大学）　　夏　勇（北京航空航天大学）
肖运海（河南大学）　　徐凤敏（西安交通大学）
徐　姿（上海大学）　　闫喜红（太原师范学院）
杨月婷（北华大学）　　张　鹏（山东大学）
张　涌（中科院深圳先进技术研究院）　　张　昭（浙江师范大学）
赵克全（重庆师范大学）　　赵欣苑（北京工业大学）
朱志斌（桂林电子科技大学）

六、组织委员会

主任：（按照姓氏汉语拼音排序）

白延琴（上海大学）　　丁　超（中科院数学院）
吕长虹（华东师范大学）　　万国华（上海交通大学）
王国强（上海工程技术大学）

副主任：（按照姓氏汉语拼音排序）

葛冬冬（上海交通大学）　　何斯迈（上海交通大学）
胡　捷（武汉大学）　　郦旭东（复旦大学）
刘　彬（中国海洋大学）　　罗自炎（北京交通大学）
梅丽丽（杭州电子科技大学）　　王长军（中科院数学院）
吴晨晨（天津理工大学）　　殷志祥（上海工程技术大学）
余长君（上海大学）　　赵欣苑（北京工业大学）

委员：（按照姓氏汉语拼音排序）

白延琴（上海大学）　　丁　超（中科院数学院）
高雪瑞（上海工程技术大学）　　葛冬冬（上海交通大学）
何斯迈（上海交通大学）　　胡　捷（武汉大学）
江　波（上海财经大学）　　李　倩（上海工程技术大学）
郦旭东（复旦大学）　　林贵华（上海大学）
林辉球（华东理工大学）　　刘　彬（中国海洋大学）
罗自炎（北京交通大学）　　吕长虹（华东师范大学）
梅丽丽（杭州电子科技大学）　　万国华（上海交通大学）
王长军（中科院数学院）　　王国强（上海工程技术大学）
王祥丰（华东师范大学）　　王燕军（上海财经大学）
吴晨晨（天津理工大学）　　吴　迪（上海工程技术大学）
闫　辛（上海对外经贸大学）　　余长君（上海大学）
宇振盛（上海理工大学）　　周安娃（上海大学）
郑小金（同济大学）　　赵欣苑（北京工业大学）

七、大会报告人（按照字母序排序）

刘亚锋	北京邮电大学	罗智泉	香港中文大学（深圳）
Yurii Nesterov	Corvinus University of Budapest、香港中文大学（深圳）	R. T. Rockafellar	University of Washington
Shang-Hua Teng	University of Southern California	Kim-Chuan Toh	National University of Singapore
徐大川	北京工业大学	周志华	南京大学

八、青年邀请报告人（按照姓氏汉语拼音排序）

陈飞宇（重庆国家应用数学中心）
蒋　杰（重庆大学）
李　敏（山东师范大学）
袁雁城（香港理工大学）
姜　波（南京师范大学）
姜少峰（北京大学）
邱宇谋（北京大学）
曾尚志（南方科技大学）

九、短期课程

1、课程名称：大规模聚类的高效近似算法设计
主讲教师：冯启龙（中南大学）

2、课程名称：Composite Cardinality Optimization: Theory and Algorithms
主讲教师：戚厚铎（香港理工大学）

十、会议日程概要

<table>
<tr><th></th><th colspan="2">5 月 16 日（周五）</th><th>5 月 17 日（周六）</th><th>5 月 18 日（周日）</th></tr>
<tr><td>8:00-8:30</td><td rowspan="19">报到:上海富悦大酒店大堂</td><td rowspan="2"></td><td></td><td rowspan="2"></td></tr>
<tr><td>8:30-9:00</td><td>开幕式</td></tr>
<tr><td>9:00-9:50</td><td rowspan="5">短期课程
《大规模聚类的高效近似算法设计》</td><td>大会报告</td><td rowspan="3">大会报告</td></tr>
<tr><td>9:50-10:20</td><td>茶歇</td></tr>
<tr><td>10:20-10:40</td><td rowspan="3">大会报告</td></tr>
<tr><td>10:40-11:10</td><td>茶歇</td></tr>
<tr><td>11:10-12:00</td><td>大会报告</td></tr>
<tr><td>12:00-13:30</td><td>午餐（一楼馨香园）</td><td colspan="2">午餐（一楼馨香园/曼哈顿）</td></tr>
<tr><td>13:30-14:00</td><td></td><td rowspan="2">大会报告</td><td rowspan="3">专题报告（30 场）</td></tr>
<tr><td>14:00-15:10</td><td rowspan="4">短期课程
《Composite Cardinality Optimization: Theory and Algorithms》</td></tr>
<tr><td>15:10-15:40</td><td>茶歇</td></tr>
<tr><td>15:40-16:30</td><td rowspan="3">青年邀请报告（2 场）、专题报告（10 场）、张贴海报报告</td></tr>
<tr><td>16:30-16:45</td><td>茶歇</td></tr>
<tr><td>16:45-17:00</td><td rowspan="3">专题报告（1 场）、
自由报告（13 场）</td></tr>
<tr><td>17:00-18:00</td><td></td></tr>
<tr><td>18:00-18:15</td><td rowspan="3">晚餐（一楼馨香园）</td><td rowspan="3">晚宴（三楼富悦厅）</td></tr>
<tr><td>18:15-18:30</td><td>闭幕式</td></tr>
<tr><td>18:30-20:00</td><td>晚餐（一楼馨香园）</td></tr>
<tr><td>20:00-21:00</td><td>第八届理事会第二次会议</td><td></td><td></td></tr>
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中国运筹学会数学规划分会
第十五届全国数学优化学术会议
会议日程简表

5 月 16 日 （星期五）			
时间	地点	议程	主持人
8:00-21:00	报到（上海富悦大酒店大堂）		
9:00-12:00	三楼 8 号会议室	**短期课程：**大规模聚类的高效近似算法设计 **主讲：**冯启龙（中南大学）	张　昭
12:00-13:30	午餐（一楼馨香园餐厅）		
14:00-17:00	三楼 8 号会议室	**短期课程：** Composite Cardinality Optimization:Theory and Algorithms **主讲：**戚厚铎（香港理工大学）	孔令臣
18:00-20:00	晚餐（一楼馨香园餐厅）		
20:00-21:30	三楼 8 号会议室	第八届理事会第二次会议	丁　超

5 月 17 日 （星期六）			
时间	**地点**	**议程**	**主持人**
8:30-9:00	三楼富悦厅	**开幕式** 主持人宣布大会开幕、介绍嘉宾 上海工程技术大学校领导致辞 中国运筹学会领导致辞 中国运筹学会数学规划分会理事长致辞	丁　超
9:00-9:50	三楼富悦厅	**大会报告：**Decentralization in Solving Problems of Optimization **报告人：**R. T. Rockafellar　University of Washington	孙德锋
9:50-10:20	茶歇		
10:20-11:10	三楼富悦厅	**大会报告：** Asymmetric Long-Step Primal-Dual Interior-point Methods with Dual Centering **报告人：**Yurii Nesterov Corvinus University of Budapest、香港中文大学（深圳）	文再文
11:10-12:00	三楼富悦厅	**大会报告：**Anti-Jamming Strategy Learning via Domain-Knowledge Enhanced Online Convex Optimization **报告人：**罗智泉　香港中文大学（深圳）	简金宝
12:00-13:30	午餐（一楼馨香园/曼哈顿）		
13:30-14:20	三楼富悦厅	**大会报告：**Intelligent Heuristics are the Future of Computing **报告人：**Shang-Hua Teng　University of Southern California	张　昭
14:20-15:10	三楼富悦厅	**大会报告：**A Low-Rank ALM for Doubly Nonnegative Relaxations of Mixed-Binary QP **报告人：**Kim-Chuan Toh　National University of Singapore	苏文藻
15:10-15:40	茶歇		
15:40-17:40	二楼悦贵 1 厅	**青年邀请报告 I** 袁雁城　香港理工大学 曾尚志　南方科技大学	刘　歆
		姜　波　南京师范大学 陈飞宇　重庆国家应用数学中心	文再文
	二楼悦贵 2 厅	**青年邀请报告 II** 邱宇谋　北京大学 蒋　杰　重庆大学	孙海琳
		姜少峰　北京大学 李　敏　山东师范大学	夏　勇
15:40-17:10	三楼 1 号会议室	**专题报告 A1 流形优化理论、算法与应用** （组织者：高斌） 黄　文　厦门大学 竺筱晶　上海电力大学 李建泽　中山大学	高　斌
	三楼 2 号会议室	**专题报告 A2　多目标优化理论、算法与应用** （组织者 唐莉萍、罗浩） 樊卓鑫　重庆师范大学 罗　浩　重庆国家应用数学中心/重庆师范大学	唐莉萍

		陈纯荣　重庆大学	
	三楼 3 号会议室	**专题报告 A3　信号处理中的优化** （组织者：刘亚锋、杨在） 邵明杰　中国科学院数学与系统科学研究院 黄永伟　广东工业大学 陶梅霞　上海交通大学	刘亚锋
	三楼上海厅	**专题报告 A4　全局优化** （组织者：路程） 罗和治　浙江师范大学 焦红伟　河南科技学院 陈　亮　中国科学院数学与系统科学研究院	路　程
	三楼 5 号会议室	**专题报告 A5　算法博弈论** （组织者：程郁琨） 罗俊杰　北京交通大学 占　杨　南京大学 陈修杨　浙江师范大学	程郁琨
	三楼 6 号会议室	**专题报告 A6　面向人工智能大模型的最优化方法** （组织者：袁坤） 李　肖　香港中文大学（深圳） 孙若愚　香港中文大学（深圳） 袁　坤　北京大学	袁　坤
	三楼 7 号会议室	**专题报告 A7　优化算法软件机器应用** （组织者：刘勇进） 吴中明　南京信息工程大学 黄亚魁　西安电子科技大学 陈艳男　华南师范大学	刘勇进
	三楼 8 号会议室	**专题报告 A8　整数规划** （组织者：陈伟坤） 雷震东　华为公司 王孟昌　阿里巴巴达摩院 皇甫琦　杉数科技	陈伟坤
	三楼 9 号会议室	**专题报告 A9　近似算法** （组织者：许宜诚） 王晨豪　北京师范大学（珠海） 余　炜　华东理工大学 冉颖丽　浙江师范大学	许宜诚
	二楼悦贵 3 厅	**专题报告 A10　大数据统计优化** （组织者：朱利平） 亓颢博　北京师范大学 贺百花　中国科学技术大学 郭　旭　北京师范大学	朱利平
17:10-18:00	三楼过道	**海报展示**	
18:00-20:15	晚宴（三楼富悦厅）		

5 月 18 日 （星期日）			
时间	**地点**	**议程**	**主持人**
9:00-9:50	三楼富悦厅	**大会报告：**反绎学习:数据知识双驱动的人工智能新范式 **报告人：**周志华　南京大学	韩德仁
9:50-10:40	三楼富悦厅	**大会报告：**One-Bit Precoding in Massive MIMO: Algorithm Design and Asymptotic Performance Analysis **报告人：**刘亚锋　北京邮电大学	范金燕
10:40-11:10	茶歇		
11:10-12:00	三楼富悦厅	**大会报告：**次模优化理论与算法研究 **报告人：**徐大川　北京工业大学	黄正海
12:00-13:30	午餐（一楼馨香园、一楼曼哈顿）		
13:30-15:00	三楼 1 号会议室	**专题报告 B1　流形优化理论、算法与应用** （组织者：高斌） 陈士祥　中国科学技术大学 肖纳川　香港中文大学（深圳） 邓康康　国防科技大学	白敏茹
	三楼 2 号会议室	**专题报告 B2　多目标优化理论、算法与应用** （组织者：唐莉萍、罗浩） 吴唯钿　宁波工程学院 陈　健　重庆师范大学 赵晓芃　天津工业大学	徐　姿
	三楼 3 号会议室	**专题报告 B3　信号处理中的优化** （组织者：刘亚锋、杨在） 张纵辉　香港中文大学（深圳） 凌舒扬　上海纽约大学 魏志强　西安交通大学	夏　勇
	三楼上海厅	**专题报告 B4　全局优化** （组织者：路程） 邓智斌　中国科学院大学 岑小丽　太原师范学院 闫　辛　上海对外经贸大学	韩丛英
	三楼 5 号会议室	**专题报告 B5　博弈与优化** （组织者：盖玲） 盖　玲　上海理工大学 录岭法　郑州大学 陈如冰　郑州大学	盖　玲
	三楼 6 号会议室	**专题报告 B6　最优化与大模型** （组织者：王祥丰） 谢中林　北京大学 周宸宇　上海交通大学 王祥丰　华东师范大学	王祥丰
	三楼 7 号会议室	**专题报告 B7　随机优化算法** （组织者：肖现涛，王晓）	肖现涛

		方　聪　北京大学 邓　琪　上海交通大学 梁经纬　上海交通大学	
	三楼 8 号会议室	**专题报告 B8　随机一阶算法** （组织者：韩德仁，谢家新） 彭　拯　湘潭大学 郭少艳　大连理工大学 周声龙　北京交通大学	韩德仁
	三楼 9 号会议室	**专题报告 B9　组合优化** （组织者：周宏） 肖　汉　中国海洋大学 周　宏　福州大学 陶亦心　上海财经大学	周　宏
	二楼悦贵 3 厅	**专题报告 B10　大数据统计优化** （组织者：朱利平） 周　帆　上海财经大学 杨松山　中国人民大学统计与大数据研究院 严晓东　西安交通大学	江　波
	三楼 11 号会议室	**专题报告 B11 双层优化方法及应用** （组织者：尧伟） 黄飞虎　南京航空航天大学 柯荣住　浙江大学 尧　伟　南方科技大学	尧　伟
	二楼悦贵 1 厅	**专题报告 B12　随机优化** （组织者：孙海琳） 张立平　清华大学 赵　勇　重庆交通大学 刘　嘉　西安交通大学	孙海琳
	二楼悦贵 2 厅	**专题报告 B13　整数规划** （组织者：郑小金） 李　娜　东华大学 马　浩　同济大学 秦圣坤　同济大学 刘中正　同济大学	郑小金
	二楼悦华 1 厅	**专题报告 B14　非光滑优化** （组织者：边伟） 蔡冬玲　中国科学院数学与系统科学研究院 温　博　宁波工程学院 吴　帆　哈尔滨工业大学	边　伟
	二楼悦华 2 厅	**专题报告 B15 变分与半变分不等式的理论、方法与应用** （组织者：曾生达） 曾生达　重庆师范大学 罗建锋　中北大学 岑金夏　浙江师范大学	曾生达

15:00-16:30	三楼 1 号会议室	**专题报告 C1　流形优化理论、算法与应用** （组织者：高斌） 高　志　北京大学 王　磊　香港理工大学 杨　涛　广西大学 李泽通　香港科技大学（广州）	彭定涛
	三楼 2 号会议室	**专题报告 C2　多目标优化理论、算法与应用** （组织者 唐莉萍、罗浩） 李高西　重庆工商大学 王金华　杭州师范大学 矫立国　东北师范大学	罗　浩
	三楼 3 号会议室	**专题报告 C3　信号处理中的优化** （组织者：刘亚锋、杨在） 范熙来　中国科学院数学与系统科学研究院 徐　勐　中国科学院数学与系统科学研究院 宋恩彬　四川大学	杨　在
	三楼上海厅	**专题报告 C4　全局优化** （组织者：路程） 康高健　华北电力大学 李润泽　清华大学 张雨暄　清华大学	罗和治
	三楼 5 号会议室	**专题报告 C5　博弈与优化** （组织者：盖玲） 农庆琴　中国海洋大学 许宜诚　中国科学院深圳先进技术研究院 张　涌　中国科学院深圳先进技术研究院	张　鹏
	三楼 6 号会议室	**专题报告 C6　最优化与大模型** （组织者：王祥丰） 严骏驰　上海交通大学 钱　鸿　华东师范大学 丁　添　深圳市大数据研究院	江如俊
	三楼 7 号会议室	**专题报告 C7　随机优化算法** （组织者：肖现涛，王晓) 罗　珞　复旦大学 邱俊文　新加坡国立大学 王　晓　中山大学	王　晓
	三楼 8 号会议室	**专题报告 C8　随机一阶算法** （组织者：韩德仁，谢家新） 黄　琨　香港中文大学（深圳） 徐玲玲　南京师范大学 伍　浩　南京航空航天大学	谢家新
	三楼 9 号会议室	**专题报告 C9　组合优化** （组织者：陈林） 张宇昊　上海交通大学 许晨阳　华东师范大学	陈　林

		王长军　中国科学院数学与系统科学研究院	
	二楼悦贵 3 厅	**专题报告 C10　学习优化** （组织者：王阿康) 邱烨卿　香港中文大学（深圳） 陈　乾　香港中文大学（深圳） 李天佑　北京大学	王阿康
	三楼 11 号会议室	**专题报告 C11　次模优化** （组织者：杨瑞琪） 张智杰　福州大学 陈晟敏杰 中国科学院计算技术研究所 张洪祥　中国科学院大学	杨瑞琪
	二楼悦贵 1 厅	**专题报告 C12　随机优化** （组织者：孙海琳） 孙海琳　南京师范大学 雷金龙　同济大学 吴　琼　南京师范大学	蔡邢菊
	二楼悦贵 2 厅	**专题报告 C13　机器学习优化算法与理论** （组织者：谢中林) 邓展望　北京大学 聂涵韬　北京大学 谢中林　北京大学	谢中林
	二楼悦华 1 厅	**专题报告 C14　非光滑优化问题的高效算法** （组织者：姜波） 李庆娜　北京理工大学 曾燎原　浙江工业大学 陈永鑫　北京航空航天大学	姜　波
	二楼悦华 2 厅	**专题报告 C15　变分与半变分不等式的理论、方法与应用** （组织者：曾生达） 杜今生　广西大学 吴增宝　洛阳师范学院 陈　涛　西南石油大学	闫喜红
16:30-16:45	茶歇		
16:45-18:15	二楼悦贵 1 厅	**专题报告 D1　随机优化** （组织者：孙海琳） 周　斌　南京邮电大学 查　啸　香港理工大学 马文韬　香港理工大学	陈彩华
	三楼 1 号会议室	**分组自由报告 1　连续优化** 何　亮　重庆工商大学 井　霞　北方民族大学 马素霞　宁夏大学 肖亮海　暨南大学 杨林鑫　香港中文大学（深圳）	周安娃
	三楼 2 号会议室	**分组自由报告 2　连续优化** 李　昕　大连理工大学	焦红伟

		屈云飞　北京航空航天大学 史子剑　广西大学 吴　迪　上海工程技术大学	
	三楼 3 号会议室	**分组自由报告 3　连续优化** 高雪瑞　上海工程技术大学 熊锦欣　香港中文大学（深圳） 王晓宙　华南师范大学 张　辉　曲阜师范大学 赵弘欣　中国科学院数学与系统科学研究院	陈海滨
	三楼上海厅	**分组自由报告 4　连续优化** 李　倩　上海工程技术大学 李　帅　北京交通大学 石　旭　复旦大学 吴育洽　深圳大学 赵佩佩　太原师范学院	黄亚魁
	三楼 5 号会议室	**分组自由报告 5　连续优化** 付文豪　苏州科技大学 刘儒玉　华南理工大学 陶　敏　南京大学 王　杰　中国科学院数学与系统科学研究院 吴朋程　香港理工大学	寇彩霞
	三楼 6 号会议室	**分组自由报告 6　连续优化** 李雪柳　广西大学 彭再云　重庆交通大学 商桐桐　贵州大学 唐新东　香港浸会大学 郑丽娟　重庆工商大学	胡胜龙
	三楼 7 号会议室	**分组自由报告 7　连续优化** 常小凯　兰州理工大学 邓兰梅　四川农业大学 胡昕霖　广东工业大学 赵志华　西安电子科技大学	潘少华
	二楼悦贵 3 厅	**分组自由报告 8　连续优化、统计与随机优化** 丁彦昀　深圳职业技术大学 何　鑫　西华大学 黄遵杰　四川师范大学 涂　凯　深圳大学 张耀嘉　西南石油大学	肖义彬
	三楼 9 号会议室	**分组自由报告 9　统计与随机优化** 常　超　广西大学 黄凌伟　海南大学 王　爽　内蒙古大学 王　鑫　北京交通大学 殷方浩　山东财经大学	邵元海

		张玉明　北方民族大学	
	二楼悦贵 2 厅	**分组自由报告 10　整数规划与组合优化** 陈　锐　香港中文大学（深圳） 韩　娜　华东理工大学 江弘亿　香港城市大学 罗开平　北京航空航天大学 唐　震　上海工程技术大学 邹蒙川　中国科学院软件研究所	徐凤敏
	三楼 11 号会议室	**分组自由报告 11　优化应用与软件** 陈治剑　广西大学 郎一凡　北方民族大学 吴　灿　海南大学 徐芳芳　山东科技大学	肖运海
	二楼悦华 1 厅	**分组自由报告 12　优化应用与软件** 陈　鑫　北京航空航天大学 毛显鹏　广西大学 修贤超　上海大学 牙韩欣　广西大学 张本鑫　桂林电子科技大学	袁功林
	二楼悦华 2 厅	**分组自由报告 13　其他** 金其余　内蒙古大学 刘建勋　广西民族大学 王　昕　河北大学 肖　翔　上海工程技术大学 于冬梅　辽宁工程技术大学 钟昊男　云南财经大学	张晓岩
18:15-18:30	三楼 8 号会议室	闭幕式	
18:15-20:00	晚餐（一楼馨香园）		

报告题目和摘要

短期课程

大规模聚类的高效近似算法设计

冯启龙　　中南大学

报告摘要：数据聚类是机器学习领域的基础问题之一，在芯片设计、图像处理、社交网络分析等领域有着广泛应用。随着数据规模的增长，一系列多项式时间聚类算法容易产生较大的聚类结果偏差。此外，大规模数据聚类相较于传统聚类增加了计算资源限制。在此背景下，本课程将系统介绍面向大规模数据的高效聚类方法，包括聚类核心集构造、高维数据的维度处理、大规模聚类线性时间近似算法设计、分布式和并行模型下受约束聚类高效近似算法设计等一系列前沿方法。课程首先介绍大规模聚类的核心集构造，在保持聚类质量的前提下实现数据规模的高效压缩。接着，课程将介绍列子集选择等维度处理方法在高维数据中的应用。在此基础上，课程将介绍基于局部搜索的大规模聚类线性时间近似算法设计。最后，课程将介绍分布式与并行计算模型下，如何针对各类约束构造高效的聚类近似算法。本课程旨在系统阐释大规模数据聚类的核心理论，并结合典型聚类问题深入解析高效算法的设计与优化思路，为大规模聚类数据的高效处理提供新的研究方法与视角。

报告人简介：冯启龙，中南大学计算机学院教授，博士生导师，计算机学院副院长。主要从事大规模聚类算法优化，计算机算法优化等方面的研究。在 Information and Computation、SODA、NeurIPS、ICML、ICLR 等期刊和国际会议上发表论文 60 多篇。近年来主持国家自然科学基金重点项目等项目 20 余项。担任中国计算机学会理论计算机科学专业委员会常委，中国计算机学会人工智能专业委员会委员，担任期刊 Frontier Computer Science 青年编委，国际会议 TAMC2020 大会主席。

Composite Cardinality Optimization: Theory and Algorithms

戚厚铎　　香港理工大学

报告摘要：Cardinality function counts the number of nonzero elements of its input. It acts naturally as a loss function in many machine learning applications. Cardinality optimization has attracted much attention and seen significant progress over the past few years. Composite cardinality function is the cardinality function compounded with affine mappings and hence has a capability of modelling even a wider range of applications. Therefore, Composite Cardinality Optimization (CCOPT) is fundamental. Unlike the cardinality function, whose discontinuous regions are subspaces, composite cardinality has discontinuous regions being the unions of polyhedral sets of exponentially many. This imposes a significant challenge in both developing optimization theory and algorithms. This short course aims to introduce the latest progress on CCOPT and consists of the following parts.

1. Motivations: examples and applications.
2. Review of the state-of-the-art in CCOPT.
3. Local duality theory: extension of Fenchel duality to stationary duality.
4. Algorithms on the primal and dual problems.

We conclude the course with a discussion on some open questions and future research directions.

报告人简介： Houduo Qi is a professor at the department of applied mathematics, the Hong Kong Polytechnic University. He received the BSc in Statistics from Peking University in 1990, MSc and PhD in Operational Research and Optimal Control, respectively from Qufu Normal University (1993) and the Institute of Applied Mathematics, Chinese Academy of Sciences (CAS) in 1996. He has been postdoctoral fellows at the Institute of Computational Mathematics, CAS, the Hong Kong Polytechnic University, and the University of New South Wales before joining the University of Southampton in 2004 as a lecturer in Operational Research, rising to Professor and Chair of Optimization.

He was awarded the prestigious Queen Elizabeth II Fellowship (QEII Fellow) by the Australian Research Council (2003) and Turing Fellow in 2019 by the Alan Turing Institute, UK's national institute of data science. He recently joined the Hong Kong Polytechnic University. He is mainly interested in Mathematical Optimization, especially in matrix optimization with applications to finance and statistics. He is currently the area editor (Optimization) of Asia-Pacific Journal of Operational Research, associate editor for Mathematical Programming Computation and Journal of Operations Research Society of China. From 2010, he has been a college member of Engineering and Physical Sciences Research Council, UK.

大会报告

Decentralization in Solving Problems of Optimization

R. T. Rockafellar　University of Washington

报告摘要： Problems of optimization have for a very long time been studied from the perspective of decentralization. Earlier that was for theoretical understanding in economics, but now it's for purposes of large-scale computation. The fundamental idea is that the large problem under consideration is likely comprised of numerous potential subproblems for independent decision-makers --- agents --- who can't, however, solve them independently because of resources that must be shared among them.

How should that sharing be achieved in order to ensure optimality in the combined problem? One traditional approach is to bring in a master planner to allocate the resources among the many agents. Then the challenge is to understand how to solve the problem facing that master planner. Another traditional approach is to bring in a market for buying and selling the resources, and then to determine (still centrally) prices such that, if the agents could buy and sell at those prices, their individually optimal decisions would produce the collectively optimal response, without need for anyone having to come up with allocations. Then, however, the challenge is figuring out the special prices that would accomplish this.

In fact, there is a duality between the two approaches which makes them, in a sense, equivalent. Moreover in computational approaches to this kind of problem, in meeting the demands of machine learning, everything must be executed in iterations.Then it's not a magical all-at-once, and instead both ideas may have to come into play repeatedly. And the sparsity in the interactions needs to be taken seriously.

报告人简介：R. T. Rockafellar 是美国华盛顿大学荣誉退休教授。1963 年博士毕业于哈佛大学。Rockafellar 教授在凸分析、变分分析、风险理论和优化领域做出了划时代和显著的贡献。他于 1970 年出版的《凸分析》专著已经成为凸分析与优化领域的经典著作，他与其他学者合著有一些经典专著，如《变分分析》和《隐函数与解映射》，这些书籍在变分分析、最优控制、数学规划和随机优化的发展中具有重要影响。R. T. Rockafellar 发表了 200 多篇论文，有多个定理和方法以他的名字命名。他也是多个著名国际数学刊物的编委，曾分别于 1966 年和 1983 年应邀在国际数学家大会上做 45 分钟报告，获得多项国际奖项与荣誉，其中包括 SIAM 与数学规划学会联合颁发的 Dantzig 奖，INFORMS 约翰·冯·诺依曼理论奖。

Asymmetric Long-Step Primal-Dual Interior-Point Methods with Dual Centering

Yurii Nesterov　Corvinus University of Budapest、香港中文大学（深圳）

报告摘要：We discuss a new way of development of Interior-Point Methods (IPMs) for solving primal-dual problems of Conic Optimization. It is efficient for problems with asymmetric complexity, which often arise, in particular, in Semidefinite Optimization (SDO). Our long-step predictor-corrector scheme is based on centering in the dual space and controlling the tangent step size by the functional proximity measure. For symmetric cones, the search procedure is very cheap.

In this approach, we do not need sophisticated Linear Algebra, restricting ourselves only by Cholesky factorization, even for SDO. However, our complexity bounds correspond to the best-known polynomial-time results. As an example, we discuss some classes of SDO-problems, where the complexity bounds are proportional to the square root of the number of linear equality constraints. We support our theoretical developments by preliminary but encouraging numerical testing with random SDO-problems.

报告人简介：Yurii Nesterov，Corvinus University of Budapest、香港中文大学（深圳）教授，欧洲科学院院士，美国国家科学院院士，于 1984 年在莫斯科控制科学研究所获得应用数学博士学位，并自 1993 年起在 CORE 工作。研究兴趣涉及优化问题的复杂性分析及高效求解方法，主要成果集中于凸优化领域，包括光滑问题的最优算法、多项式时间内点法、结构优化的平滑技术、二阶方法的复杂性理论以及超大规模问题的优化方法。著有 6 部专著，并在顶级优化期刊上发表了 150 余篇论文。曾获得多项国际奖项与荣誉，其中包括 SIAM 与数学规划学会联合颁发的 Dantzig 奖，INFORMS 约翰·冯·诺依曼理论奖，SIAM 杰出论文奖，欧洲运筹学学会（EURO）金奖，INFORMS Lanchester 奖，世界顶尖科学家协会（WLA）计算机科学或数学奖。

Anti-Jamming Strategy Learning via Domain-Knowledge Enhanced Online Convex Optimization

罗智泉　香港中文大学（深圳）

报告摘要：The dynamic competition between radar and jammer systems presents a significant challenge for modern electronic warfare, as current anti-jamming approaches still lack sample efficiency and fail to exploit jammer's characteristics. In this work, we revisit the anti-jamming strategy learning problem through the lens of online convex optimization, which offers a rigorous and elegant framework to study this specific problem. This perspective enables us to identify a critical structural insight: useful information about the jammer's behavior can be inherently encoded in the gradient of the cost function. By leveraging this insight, we demonstrate that online interaction samples can be systematically utilized to effectively learn the anti-jamming strategies. This structured approach introduces a practical mechanism for incorporating prior knowledge of the jammer, which significantly enhances the real-world applicability of the anti-jamming process.

报告人简介：罗智泉教授是中国工程院外籍院士、加拿大皇家科学院院士、香港中文大学（深圳）副校长、深圳市大数据研究院院长、香港中文大学（深圳）—深圳市大数据研究院—华为未来网络系统优化创新实验室主任。他于 1984 年获北京大学数学系学士学位，1989 年获美国麻省理工学院电子工程与计算机科学系运筹学博士学位。他是 SIAM 会士和 IEEE 会士以及 IEEE 信号处理期刊主编（2012-2014）。罗智泉教授的学术成果包括无线通信的收发机优化设计、最优鲁棒波束成形设计、动态频谱管理等，相关论文分别获得 2004 年、2009 年、2011 年和 2015 年 IEEE 信号处理学会、2011 年国际通信大会、欧洲信号处理学会以及 2020 年世界华人数学家联盟最佳论文奖；因在优化理论方面的杰出贡献，2010 年被美国运筹和管理科学协会授予 Farkas 奖，2018 年被国际数学优化学会授予 Tseng 纪念奖，2022 年被中国工业与应用数学学会授予第一届王选应用数学奖。2020 年，挑战网络效能最大化的难题，他开创性地提出了数据驱动的网络优化技术路线和算法框架，成功将数据驱动网络统计模型与人工智能技术深度融合。成果被华为 GTS 认定为"根技术"，目前已成功应用于 30 多个国家的无线网络，优化超过 180 万个基站，显著提升了网络性能。该技术不仅惠及全球四分之一人口，还为电信运营商大幅降低了运营成本和碳排放，产生了显著的经济效益和社会效益。

Intelligent Heuristics are the Future of Computing

Shang-Hua Teng University of Southern California

报告摘要：Back in 1988, game trees for chess were among the largest search structures in real-world computing. Because such trees are too large to evaluate exhaustively, chess programs must rely on heuristic strategic decisions based on partial information—making them a powerful case study for teaching AI search. In one of his lectures that year on AI search for games and puzzles, Professor Hans Berliner — a pioneer in computer chess — stated: “Intelligent heuristics are the future of computing.”

As a student of computing theory, I was naturally perplexed but fascinated by this perspective. I had been trained to believe that “algorithms and computational complexity theory are the foundation of computer science.” And yet, my own journey to understand heuristics in computing has played a defining role in my career as a theoretical computer scientist. Over time, I’ve come to appreciate Berliner's statement as a far-reaching worldview—one that resonates even more in our current era of rich, complex, and multifaceted data and models, where computing interacts deeply with science, engineering, the humanities, and society.

In this talk, I will reflect on my experiences with heuristics in computing, highlighting examples of theoretical work aimed at understanding the behavior of heuristics on real data, as well as efforts to design practical heuristics with meaningful theoretical foundations. My hope is that these insights—drawn from techniques such as spectral partitioning, multilevel methods, the simplex method, and regularization for optimization and machine learning—can shed light on, and perhaps inspire, a deeper understanding of the current and future techniques in AI and data mining.

报告人简介：Shang-Hua Teng is a USC University Professor of Computer Science and Mathematics. He is a fellow of SIAM, ACM, and Alfred P. Sloan Foundation, and has twice won the Gödel Prize, first in 2008, for developing smoothed analysis, and then in 2015, for designing the breakthrough scalable Laplacian solver. Citing him as, “one of the most original theoretical computer scientists in the world”, the Simons Foundation named him a 2014 Simons Investigator to pursue long-term curiosity-driven fundamental research. He also received the 2009 Fulkerson Prize, 2023 Science & Technology Award for Overseas Chinese from the China Computer Federation, 2022 ACM SIGecom Test of Time Award (for settling the complexity of computing a Nash equilibrium), 2021 ACM STOC Test of Time Award (for smoothed analysis), 2020 Phi Kappa Phi Faculty Recognition Award (2020) for his book Scalable Algorithms for Data and Network Analysis, 2011 ACM STOC Best Paper Award (for improving maximum-flow minimum-cut algorithms). In addition, he and

collaborators developed the first optimal well-shaped Delaunay mesh generation algorithms for arbitrary three-dimensional domains, settled the Rousseeuw-Hubert regression-depth conjecture in robust statistics, and resolved two long-standing complexity-theoretical questions regarding the Sprague-Grundy theorem in combinatorial game theory. For his industry work with Xerox, NASA, Intel, IBM, Akamai, and Microsoft, he received fifteen patents in areas including compiler optimization, Internet technology, and social networks.

A Low-Rank ALM for Doubly Nonnegative Relaxations of Mixed-Binary QP

Kim-Chuan Toh National University of Singapore

报告摘要： Doubly nonnegative (DNN) programming problems are known to be challenging to solve because of their huge number of $\Omega(n^2)$ constraints and $\Omega(n^2)$ variables. In this work, we introduce RiNNAL, a method for solving DNN relaxations of large-scale mixed-binary quadratic programs by leveraging their solutions' possible low-rank property. RiNNAL is a globally convergent Riemannian based augmented Lagrangian method (ALM) that penalizes the nonnegative and complementarity constraints while preserving all other constraints in the ALM subproblems. After applying the low-rank decomposition to the ALM subproblem, its feasible region becomes an algebraic variety with favorable geometric properties. Our low-rank decomposition model is different from the standard Burer-Monteiro (BM) decomposition model in that we make the crucial step to equivalently reformulate most of the quadratic constraints after the BM decomposition into fewer and more manageable affine constraints. This modification is also important in helping us to alleviate the violation of Slater's condition for the primal DNN problem. Moreover, we make the crucial step to show that the metric projection onto the algebraic variety, although non-convex, can be transformed into a tractable convex optimization problem under certain regularity conditions. Numerous numerical experiments are conducted to validate the efficiency of the proposed RiNNAL method. [Joint work with Di Hou and Tianyun Tang]

报告人简介：Kim-Chuan Toh（卓金全）教授是新加坡国立大学数学系的 Leo Tan 冠名教授。卓教授的研究方向广泛，在凸规划领域造诣深厚，成果丰硕，尤为擅长解决大规模矩阵优化问题，例如半定规划以及机器学习和统计学中的稀疏优化问题等。卓教授目前担任着《Mathematical Programming Series A》的联合主编，以及《Mathematical Programming Computation》的区域编委。不仅如此，他还担任《SIAM Journal on Optimization》《Operations Research》《ACM Transactions on Mathematical Software》等诸多国际顶尖学术期刊的副主编。卓教授在数值优化领域的突出贡献，获得了国际学术界的广泛认可。2017 年，他荣获国际运筹学和管理科学研究会（INFORMS）颁发的 Farkas 奖；2018 年，他与合作者共同捧得国际数学优化学会每三年颁发一次的 Beale-Orchard Hays 奖；2024 年，他又获得国际数学优化学会的 Paul Y. Tseng 纪念奖。此外，卓教授还是新加坡国家科学院院士和美国工业与应用数学学会（SIAM）会士。

反绎学习：数据知识双驱动的人工智能新范式

周志华　南京大学

报告摘要：基于机器学习的“数据驱动”人工智能取得巨大进展，但其在可信性方面无保障的问题日益凸显。“知识驱动”人工智能虽然在数据利用方面存在天然低效性，但其基于逻辑推理可以有很好的正确性保证和可解释性。建立数据驱动与知识驱动相融合的人工智能新范式，对人工智能发展来说是一个重大挑战。本报告将简要汇报这方面的一点初步探索。

报告人简介：周志华教授，南京大学副校长，国际人工智能联合会理事会主席，ACM、AAAI、AAAS、IEEE 等主流国际学会的 Fellow，主要从事人工智能、机器学习与数据挖掘研究，著有《机器学习》《集成学习:基础与算法》等中英文著作四部，多项发明技术在重点企业转化实施成效显著，并在某重大任务中领衔攻关取得重大成果。以第一完成人获国家自然科学二等奖 2 项、国家级教学成果一等奖 1 项、教育部自然科学一等奖 3 项、江苏省科学技术一等奖 1 项，并获得 IEEE 计算机学会 Edward J. McCluskey 技术成就奖、CCF 王选奖、首届 CCF-ACM 人工智能奖、南京大学卓越教学奖等。担任教育部高校计算机类专业教指委副主任及人工智能专家委主任、国务院学位委员会计算机学科评议组成员、中国科技期刊卓越行动计划领军期刊 Frontiers of Computer Science 主编，《中国科学：信息科学》副主编、中国人工智能学会副理事长、江苏省计算机学会理事长等。

One-Bit Precoding in Massive MIMO: Algorithm Design and Asymptotic Performance Analysis

刘亚锋　　北京邮电大学

报告摘要：One-bit precoding is a promising approach to enhancing hardware efficiency in massive MIMO systems and has attracted significant research interests in recent years. However, the inherent one-bit constraint on the transmit signals poses great challenges for both precoding design and performance analysis. This talk presents recent advancements in one-bit precoding. The first part focuses on precoding design for massive MIMO systems, introducing a new negative $\ell 1$ penalty approach. This method is based on an exact penalty model that penalizes the one-bit constraint into the objective using a negative $\ell 1$-norm term. Compared to existing approaches, our approach achieves a superior trade-off between computational complexity and symbol error rate (SER) performance. Additionally, we will explore one-bit precoding design in massive MIMO integrated sensing and communication (ISAC)—a key use case in next-generation 6G systems. The second part of the talk shifts to the asymptotic SER performance analysis of a broad class of linear-quantized precoding schemes. Unlike conventional Bussgang decomposition-based analyzes, our analytical framework is grounded in random matrix theory (RMT), which is more rigorous and can be extended to more general cases. Furthermore, we will present recent findings on the asymptotic SER analysis of a widely studied nonlinear precoding scheme.

报告人简介：刘亚锋现为北京邮电大学数学科学学院教授，主要研究方向为最优化理论与算法及其在信号处理、无线通信和机器学习等领域的应用。他曾荣获多项学术奖项，包括 2011 年国际通信大会“最佳论文奖”、2018 年中国运筹学会“青年科技奖”、2020 年 IEEE 通信学会亚太地区“杰出青年学者奖”、2022 年中国工业与应用数学学会“青年科技奖”，以及 2024 年 IEEE 信号处理学会“最佳论文奖”。他目前或曾担任《IEEE Transactions on Signal Processing》、《IEEE Transactions on Wireless Communications》、《Journal of Global Optimization》、《计算数学》和《运筹学学报》等期刊的编委，并曾担任《IEEE Journal on Selected Areas in Communications》“无线通信网络中的优化理论与算法”专刊的客座编委。他是 IEEE 信号处理学会 SPCOM（Signal Processing for Communications and Networking）技术委员会成员，曾连续三年（2020—2022）入选全球前 2%顶尖科学家榜单年度科学影响力排行榜。

次模优化理论与算法研究

徐大川　　北京工业大学

报告摘要：次模优化起源于组合优化领域，旨在通过设计算法求解目标函数具有收益递减特性的优化问题。该研究在运筹学、经济学、管理科学和计算机科学等受到广泛关注，在网络优化和数据挖掘等实际应用中展现出重要价值。本报告从理论、算法和应用三个方面介绍次模优化问题的最新研究成果，重点讨论次模函数的 Jensen 型不等式刻画、Lyapunov 方法、次模优化近似算法设计以及若干拓展问题的研究进展，为深入理解次模函数结构、设计近似算法以及解决实际应用问题提供新的视角。

报告人简介：徐大川，北京工业大学数学系运筹学与控制论责任教授，数学/统计学博士生导师，北京工业大学区块链研究中心副主任。研究兴趣包括：数学优化、机器学习与优化、博弈论等。中国运筹学会常务理事，北京运筹学会副理事长，APJOR、JORSC、运筹与管理等期刊编委。获中国运筹学会 2022 年度“最美科技工作者”。主持国家自然科学重点项目、国家重点研发计划“数学和应用研究”重点专项，与国内某著名公司合作完成通讯网络优化、深度学习中的优化算法课题 2 项，结题被评为优秀。出版学术专著 2 部，在 Algorithmica、INFORMS Journal on Computing、Journal of Machine Learning Research、Mathematical Programming、Operations Research 等发表学术论文 100 余篇。

青年邀请报告 I

5 月 17 日 15:40 – 17:40 二楼悦贵 1 厅

HOT: An Efficient Halpern Accelerating Algorithm for Optimal Transport Problems

袁雁城　香港理工大学

报告摘要： This talk introduces HOT, an efficient Halpern accelerating algorithm for solving the **o**ptimal **t**ransport (OT) problems with finite supports in R^n, where the involved linear systems in the HOT algorithm can be efficiently solved in linear time complexity. Consequently, we can obtain an ε-approximate solution (in terms of the Karush-Kuhn-Tucker (KKT) residual) to the OT problem with M supports in $O(M^2/\varepsilon)$ flops, which improves the best-known computational complexity for the OT problem. For a class of important OT problems where the supports are in R^2 with ground distances calculated by L_2^2-norm, we prove that HOT can obtain an ε-approximate solution (in terms of the KKT residual) to the OT problem with M supports in $O(M^{1.5}/\varepsilon)$ flops by solving an equivalent reduced model of the discrete OT problem. We further propose an efficient procedure to recover an optimal transport plan for the original OT problem based on a solution to the reduced model, thereby overcoming the limitations of the reduced OT model in applications that require the transport plan. We implement the HOT algorithm in PyTorch and numerical results show the superior performance of the HOT algorithm compared to existing state-of-the-art algorithms for solving the OT problems. This talk is based on the joint works with Guojun Zhang, Zhexuan Gu, and Defeng Sun from The Hong Kong Polytechnic University.

报告人简介：袁雁城博士现任香港理工大学应用数学系助理教授。他的主要研究方向为连续优化，人工智能的数学基础及其在大模型、推荐系统、医疗健康、等领域的应用。他的研究成果发表于 《SIAM Journal on Optimization》、《Mathematical Programming Computation》、《Journal of Machine Learning Research》、《IEEE Transactions on Pattern Analysis and Machine Intelligence》等权威学术期刊及 NeurIPS, ICML, ICLR, ACM WWW, ACM SIGIR 等人工智能领域重要学术会议。

A Class of Gradient-Based Algorithms for Constrained Bilevel Optimization

曾尚志　南方科技大学

报告摘要：This talk presents new approaches and single-loop, Hessian-free gradient-based algorithms for solving a class of constrained bilevel optimization (BLO) problems, where the lower-level problem involves constraints that couple both upper- and lower-level variables. Such problems have recently attracted considerable interest in machine learning due to their wide applicability. However, the nonsmoothness introduced by the lower-level coupling constraints complicates the design of efficient gradient-based methods. To address this challenge, we introduce two distinct smooth reformulations of the constrained lower-level problem: one based on a smooth proximal Lagrangian value function, and the other based on a doubly regularized gap function. These reformulations transform the original BLO problem into an equivalent single-level optimization problem with smooth constraints. Building on these reformulations, we develop single-loop Hessian-free gradient-based algorithms for constrained BLO problems. Furthermore, the generality of our approach enables its extension to bilevel optimization problems with a minimax lower-level problem. Numerical experiments demonstrate the efficiency of the proposed algorithms.

报告人简介：曾尚志，南方科技大学深圳国家应用数学中心/数学系助理教授。2015 年本科毕业于武汉大学，2021 年博士毕业于香港大学。2021 年至 2024 年期间在加拿大维多利亚大学从事博士后研究工作，2024 年加入南方科技大学。研究方向包括最优化理论与方法、双层规划、机器学习优化算法。研究成果发表在 Math Program、SIAM J Numer Anal、J Mach Learn Res、IEEE Trans Pattern Anal Mach Intell，以及 ICML、NeurIPS、ICLR 等期刊和会议上。

一类非光滑流形约束优化问题的算法

姜 波　南京师范大学

报告摘要：非光滑流形约束优化问题在人工智能与数据科学等领域具有广泛的应用。本报告研究黎曼子流形上的一类非凸非光滑复合优化问题。通过将该问题等价转化为极小极大优化形式，我们从极小极大的视角展开理论分析，提出了一种灵活的黎曼下降-上升算法框架。在此框架下，我们设计了两种

易于实现的具体算法，并证明其能在$\mathcal{O}(\epsilon^{-3})$的迭代复杂度内返回问题的$\epsilon$-稳定点——该结果与当前最优复杂度一致。此外，我们分析了该框架下具体算法与已有方法的联系，这些联系不仅可以加深对算法的理解，还可以给其中一些关键参数提供了解决方案。数值实验进一步验证了所提算法的有效性。

报告人简介：姜波，南京师范大学数学科学学院教授，博士生导师。2008 年本科毕业于中国石油大学（华东），2013 年博士毕业于中国科学院数学与系统科学研究院，2014 年 8 月入职南京师范大学。主要研究方向为流形约束优化算法与理论，在 Math. Program., SIAM J. Optim, SIAM J. Sci. Comput., IEEE 汇刊等期刊和 NeurIPS 上发表多篇学术论文。曾入选第三届中国科协青年人才托举工程项目，获得 2022 年中国运筹学会青年科技奖，并于 2024 年入选江苏省“333 工程”第三层次培养对象。

基于布尔格理论电力系统状态空间分析方法

陈飞宇　　重庆国家应用数学中心

报告摘要：随着电力系统元件的不断增加，系统状态空间的规模呈指数级增长，电力系统状态空间的实时与精准分析面临着巨大挑战。我们提出了一种基于布尔格理论的系统状态空间划分方法，通过少量求解最优切负荷问题将失效/正常系统状态空间划分成若干布尔子格的并，实现系统状态空间的逐格分析。在 RBTS 与 RTS79 等标准数据集运行上述划分方法，LOLP，EEBS 等系统可靠性指标可以快速解析计算，比主流的状态枚举法与蒙特卡洛法效率提高 100 倍以上；此外，该方法还可以高效筛选临界系统状态，并辨识系统的薄弱环节。

报告人简介：陈飞宇，重庆国家应用数学中心副教授，主要从事聚类分析、电力系统分析等领域研究。近年来主持国家自然科学基金、国家重点研发计划子课题、重庆市自然科学基金等省部级及以上科研项目 5 项，发表 SCI 期刊及 CCF 会议 10 余篇。

青年邀请报告 II

5 月 17 日 15:40 – 17:40 二楼悦贵 2 厅

Inference for Local Conditional Quantile Treatment Effect Curve with High-Dimensional Covariates

邱宇谋　北京大学

报告摘要：This work investigates uniform inference for local conditional quantile treatment effect given high-dimensional covariates for observational data with a binary instrumental variable. The conditional treatment effect is heterogeneous with covariates. Under a parametric model for the local quantile regression function, we develop lasso estimation for a non-convex and non-smooth objective function to estimate the parameters of interest in the quantile regression function. An algorithm based on linear programming with linear complementarity constraints is constructed to solve this non-convex and non-smooth optimization problem. We propose debiased estimators and a pointwise inference method for the coefficients of the local quantile regression function and the local conditional quantile treatment effects. We obtain the Gaussian approximation results of the estimated local quantile treatment process and develop bootstrap resampling methods to construct uniform confidence bands for the local conditional quantile treatment effects. The performance and practical utility of the proposed method are evaluated through simulation studies and a case study on the Student Achievement and Retention (STAR) Project.

报告人简介：邱宇谋，博士毕业于爱荷华州立大学，先后在内布拉斯加林肯大学和爱荷华州立大学任教。于 2023 年加入北京大学数学科学学院、统计科学中心。他的研究包括：高维数据分析、高维协方差矩阵和精度矩阵的统计推断、因果分析、缺失数据分析。同时，他也致力于统计方法在精准农业、流行病模型、法医学等领域的应用研究。

Distributionally Robust Mean-Lower Partial Moment Model and its Discrete Approximation

蒋 杰　重庆大学

报告摘要：In this talk, we consider the distributionally robust mean-risk (DRM) model, when the risk is measured by the lower partial moment and the underlying probability distribution of the random variable is

unknown. An ambiguity set is used to hedge against a range of possible probability distributions that are consistent with most available structural or statistical information. Firstly, we establish the existence of optimal solutions of the inner maximization problem of the DRM model and optimal solutions of the outer minimization problem of the DRM model, respectively. After that, we theoretically investigate the size of the ambiguity set in the data-driven process endogenously. To find an optimal solution of the DRM model, we propose a discrete approximation scheme, and provide convergence theorems validating that optimal solution sets of discrete approximation problems converge to the optimal solution set of the DRM model. Moreover, we introduce stationary points via the optimality of the nonconvex-nonconcave DRM model, and further show that stationary points of discrete approximation problems converge to stationary points of the DRM model.

报告人简介：蒋杰，重庆大学数学与统计学院副研究员，硕士生导师。蒋杰博士 2013 年毕业于西安交通大学数学与统计学院，获得理学学士学位；2019 年先后毕业于香港理工大学应用数学系获得哲学博士和西安交通大学计算数学系获得理学博士学位。他的研究兴趣包括：随机规划，随机均衡，分布式鲁棒优化，统计优化等。发表论文总计二十余篇，其中包括运筹优化领域顶级期刊 SIOPT，MP，SIMODS 和 EJOR 等。主持国家自然科学基金青年科学基金项目 1 项，中国博士后基金面上项目 2 项和重庆博士后基金项目 1 项。

Local Search for Clustering in Almost-linear Time

姜少峰　　北京大学

报告摘要： We propose the first local search algorithm for Euclidean clustering that attains an $O(1)$-approximation in almost-linear time. Specifically, for Euclidean k-Means, our algorithm achieves an $O(c)$-approximation in $\widetilde{O}(n^{1+1/c})$ time, for any constant $c \geq 1$, maintaining the same running time as the previous (non-local-search-based) approach [la~Tour and Saulpic, arXiv'2407.11217] while improving the approximation factor from $O(c^6)$ to $O(c)$. The algorithm generalizes to any metric space with sparse spanners, delivering efficient constant approximation in l_p metrics, doubling metrics, Jaccard metrics, etc.

This generality derives from our main technical contribution: a local search algorithm on general graphs that obtains an $O(1)$-approximation in almost-linear time. We establish this through a new 1-swap local search framework featuring a novel swap selection rule. At a high level, this rule “scores” every possible swap, based on both its modification to the clustering and its improvement to the clustering objective, and then selects those high-scoring swaps. To implement this, we design a new data structure for maintaining

approximate nearest neighbors with amortized guarantees tailored to our framework.

报告人简介：姜少峰博士现任北京大学前沿计算研究中心助理教授，北京大学博雅青年学者。他博士毕业于香港大学，并先后在以色列魏茨曼科学院和芬兰阿尔托大学担任博士后研究员及助理教授。他的研究领域是理论计算机科学，侧重于组合优化问题的大数据算法、近似算法和在线算法。他的多篇研究发表于 SICOMP、TALG、STOC、FOCS、SODA 等理论计算机科学方向的顶级期刊与会议上。

带约束的 k-次模最大化问题的近似算法研究

李　敏　　山东师范大学

报告摘要：k-次模函数是次模函数的一种重要推广形式, 将定义域从单一集合扩展到 k 个不相交集合的组合上, 从而能够处理更复杂的集合交互问题，并在社交网络、传感器放置等问题中有着重要应用。在这一报告中我们将主要汇报 k-次模最大化问题在基数约束、拟阵约束以及背包约束等条件下的近似算法进展。

报告人简介：李敏，山东师范大学数学与统计学院教授，硕士生导师。研究兴趣包括聚类问题的近似算法、次模优化以及整数规划，在 Journal of Global Optimization, Journal of Combinatorial Optimization 等国际期刊及 COCOON, CSoNet 等会议上发表论文 40 余篇。先后主持教育部项目 1 项，山东省面上项目 2 项，山东省教育厅项目 1 项。

专题报告 A1 流形优化理论、算法与应用

5 月 17 日 15:40 – 17:10　三楼 1 号会议室

Riemannian Federated Learning via Averaging Gradient Stream

黄文　厦门大学

报告摘要： In recent years, federated learning has garnered significant attention as an efficient and privacy-preserving distributed learning paradigm. In the Euclidean setting, federated averaging and its variants are a class of efficient algorithms for expected (empirical) risk minimization. In this talk, we introduce and analyze a Riemannian federated averaging gradient stream (RFedAGS) algorithm to problems defined on a Riemannian manifold. The global convergence is established for fixed step sizes and decaying step sizes. Unlike the existing Riemannian federated learning whose convergence analysis only allows one agent or one step in local update, the proposed RFedAGS allows multiple agents and multiple-step local updates. Thus, RFedAGS theoretically guarantees a reduction of outer iterations and therefore reduces communication costs. Numerical simulations conducted on synthetic and real-world data demonstrate the performance of the proposed RFedAGS.

Grassmann 流形和 Stiefel 流形上的加速梯度法

竺筱晶　上海电力大学

报告摘要：本文把一类非凸 Nesterov 型加速梯度法推广到了 Grassmann 流形和 Stiefel 流形上。我们提出了一个基于指数映射-平行移动的加速梯度算法和一个基于 Cayley 变换型收缩算子-向量传输的加速梯度算法。在合理的假设条件下，我们充分利用两种流形的特殊几何结构证明了算法的全局收敛率。文中也讨论了算法所涉及的几何工具的计算细节。初步的数值结果证实了所提出算法的高效性。

Convergence Analysis of the Transformed Gradient Projection Algorithms on Compact Matrix Manifolds

李建泽　中山大学

报告摘要： In this paper, to address the optimization problem on a compact matrix manifold, we introduce a novel algorithmic framework called the Transformed Gradient Projection (TGP) algorithm, using the

projection onto this compact matrix manifold. Our framework offers flexibility by encompassing the classical gradient projection algorithms as special cases, and intersecting the retraction-based line-search algorithms. Our focus is on the Stiefel or Grassmann manifold, revealing that many existing algorithms in the literature can be seen as specific instances within our proposed framework, and this algorithmic framework also induces several new special cases. Then, we conduct a thorough exploration of the convergence properties of these algorithms, considering various search directions and stepsizes. Finally, we establish the weak convergence, convergence rate, and global convergence of TGP algorithms under three distinct stepsizes.

专题报告 A2 多目标优化理论、算法与应用

5 月 17 日 15:40 – 17:10　三楼 2 号会议室

Faster Convergence of Condtional Gradient Method for Multiobjective Optimization under Different Step Sizes

樊卓鑫　　重庆师范大学

报告摘要： This paper establishes enhanced convergence rates for the conditional gradient method in multiobjective optimization under assumptions weaker than uniform convexity for the objective functions. Structural conditions are imposed on the constraint set, including uniformly convex sets and polytopes. We analyze both adaptive step sizes and diminishing step sizes of the form $\frac{l}{k+l}$ with $l \geq 1$, improving upon the previously used $\frac{4}{k+4}$. The results show faster convergence rates surpassing the standard $O\left(\frac{1}{k}\right)$. Numerical experiments verify the theoretical results.

Accelerated Multiobjective Gradient Methods with Efficient Linear/Quadratic Subproblems

罗浩　　重庆国家应用数学中心/重庆师范大学

报告摘要： In this work, we propose two accelerated gradient methods for solving unconstrained multiobjective optimization problems. Based on the Nesterov accelerated gradient (NAG) flow in Luo and Chen (Math. Program., 195: 735-781, 2022), we derive a novel accelerated multiobjective gradient (AMG)

dynamical model. We then consider two numerical discretizations that lead to two accelerated multiobjective gradient methods. Utilizing the duality approach, the corresponding subproblems are transformed into either a quadratic projection or a linear programming. For the first method, we shall prove the sublinear rate and the linear rate respectively for convex and strongly convex problems. The second method adopts a simple linear subproblem, and theoretically, under the technical bounded assumption on the gradient, we establish the sublinear convergence rate. Numerical results are provided to validate the performance of the proposed methods.

向量优化求解的 Dai-Liao 及相关共轭梯度算法

陈纯荣　　重庆大学

报告摘要：本工作将标量优化情形下的 Dai-Liao 型共轭梯度法拓展至向量优化。推广并研究了 Dai-Liao 方法的四种变体，分别包括修正的 Dai-Liao 方法、Hager-Zhang 方法，以及两类具有充分下降性的 Dai-Liao 型方法。在无任何凸性假设的条件下，借助 Wolfe 非精确线搜索建立了所有算法的全局收敛性。特别地，针对著名的 Hager-Zhang 方法，本工作还在不具体限制算法参数的矩阵范数情形下分析其下降性与收敛性，得到了具有一般性的结果。该研究也在一定程度上揭示了标量与向量情形之间的差异。

专题报告 A3 信号处理中的优化

5 月 17 日 15:40 – 17:10　三楼 3 号会议室

Quantized Signal Sensing: Formulations and Algorithms

邵明杰　　中国科学院数学与系统科学研究院

报告摘要：In this talk, we explore sensing from quantized signals, focusing on quantized linear regression (QLR). QLR has applications across various domains, including signal processing, data analysis, and wireless communication. We introduce formulations for maximum-likelihood estimation (MLE) and amplitude retrieval (AR), highlighting new challenges involving integrals and nonsmooth objective functions. Next, we discuss algorithm designs. In quantized MIMO detection, we present the first efficient branch-and-bound method, significantly reducing complexity compared to exhaustive search. In parameter

estimation, we reveal a hidden relationship between the EM and proximal gradient method, providing valuable insights into EM convergence and facilitating the development of novel accelerated schemes. Then, we introduce a deep unfolding adaptation, supported by a theoretical explanation of the activation function in MIMO detection. Simulation results demonstrate the effectiveness of our approaches.

雷达接收阵列的鲁棒稀疏波束成形方法

黄永伟　广东工业大学

报告摘要：本工作研究了雷达接收阵列的鲁棒稀疏波束成形（RSB）设计问题。该方法基于极小极大化信号与干扰加噪声比（SINR）准则（假设期望信号导向向量和干扰加噪声协方差矩阵存在失配），同时波束向量存在稀疏性约束。针对该极小极大 SINR 优化问题，我们提出了一种 RSB 解决方案的近似算法：通过利用重加权范数正则化方法满足稀疏性要求（即对目标函数添加定制化惩罚项），并基于强对偶理论将算法中每一步问题等价地转化为小规模的半正定规划（SDP）问题。我们证明了如何从 SDP 问题的最优解中获得正则化极小极大问题的最优波束向量的解析表达式。仿真实验表明，与两种现有非鲁棒稀疏波束成形方法相比，我们提出的 RSB 解决方案在归一化波束方向图和阵列输出 SINR 方面均表现出更优的性能。

通感一体中的扩展目标感知：性能分析，波束设计及追踪算法

陶梅霞　上海交通大学

报告摘要：随着 5G-A/6G 网络向通感一体化（ISAC）深度演进，共享频谱与硬件资源实现通信与感知功能协同成为突破传统系统分离架构的关键路径。在此背景下，扩展目标感知作为无人机监管、智能交通等场景的核心需求，亟需解决多散射体分辨与运动参数估计的精度挑战。本报告面向通感一体化中的扩展目标感知问题，提出了基于中心参数和外形轮廓表征的扩展目标建模。基于该建模方式，首先对目标中心参数估计的克拉美罗下界进行了理论推导，并据此设计了联合优化通感性能的一体化波束。进一步结合 Kalman 滤波与神经网络，实现了扩展目标的高精度追踪与轮廓估计。

专题报告 A4 全局优化

5 月 17 日 15:40 – 17:10　三楼上海厅

An Effective Global Algorithm for Worst-Case Linear Optimization under Polyhedral Uncertainty

罗和治　浙江师范大学

报告摘要：In this paper, we investigate effective algorithms for the worst-case linear optimization (WCLO) under polyhedral uncertainty on the right-hand-side of the constraints that arises from a broad range of applications and is known to be strongly NP-hard. We first develop a successive convex optimization (SCO) algorithm for WCLO and show that it converges to a local solution of the transformed problem of WCLO. Second, we develop a global algorithm (called SCOBB) for WCLO that finds a globally optimal solution to the underlying WCLO within a pre-specified ϵ-tolerance by integrating the SCO method, LO relaxation, branch-and-bound framework and initialization. We establish the global convergence of the SCOBB algorithm and estimate its complexity. Finally, we integrate the SCOBB algorithm for WCLO to develop a global algorithm for the two-stage adaptive robust optimization with a polyhedral uncertainty set. Preliminary numerical results illustrate that the SCOBB algorithm can effectively find a global optimal solution to medium and large-scale WCLO instances.

Global Optimization Methods for Two Kinds of Fractional Programming Problems

焦红伟　河南科技学院

报告摘要：In this report, we aim to find the global optimal solution of two kinds of fractional programming problems (LFPP), which have numerous applications in many fields of economy and engineering. First of all, by constructing the adaptive branching method and the linear relaxation bounding technique, we propose an adaptive branch-and-bound algorithm to tackle the linear fractional multiplicative problem. Secondly, based on the Charnes-Cooper transformation technique and the outer space branch-and-bound scheme, we propose an outer space algorithm for the sum of linear ratios problem. We prove the global convergence of these algorithms and estimate maximum number of iterations in the worst case. Finally, numerical results verify the efficiency of these two algorithms.

0-1 背包集合的精确序列升维算法

陈亮　　中国科学院数学与系统科学研究院

报告摘要：升维是混合整数规划中生成强有效不等式的一项关键技术。本报告提出了一种基于占优表的精确序列升维算法，并将其与动态规划算法相结合，形成了一种混合算法。这种混合算法允许在两种算法之间灵活切换，充分利用各自的优点，从而显著提高序列升维的计算效率。此外，我们还介绍了一种新的方法，用于减少占优表或动态规划列表的规模。最后，数值结果表明，所提出的升维算法有效提升了求解效率，有望被嵌入到混合整数规划求解器中。

专题报告 A5 算法博弈论

5 月 17 日 15:40 – 17:10　三楼 5 号会议室

Computing Efficient Envy-Free Partial Allocations of Indivisible Goods

罗俊杰　　北京交通大学

报告摘要：Envy-freeness is a central fairness concept in allocating indivisible goods. While trivial envy-free allocations always exist, this fails when combined with efficiency goals such as completeness or welfare maximization, making even existence problems computationally hard. We explore the limits of efficient computability by relaxing standard efficiency concepts and allowing partial allocations with only mild efficiency constraints, such as requiring each agent to gain some utility. Surprisingly, even these weak requirements yield a rich computational landscape. We identify several polynomial-time or fixed-parameter tractable cases for binary utilities, alongside NP-hardness for ternary utilities.

Correlated Pairwise Stability in Network Formation Games

占杨　　南京大学

报告摘要：Networks are at the forefront of research in economics and operations research as powerful tools to model social and economic interactions. While to compute equilibria in network formation games is

generally very hard, we combine the concept of pairwise stability and correlated equilibria and propose the notion of correlated pairwise stability. We show that correlated pairwise stable networks can be Pareto improvement of pairwise stable networks, and its computation is much easier.

A Game-Theoretic Approach to Solving the Roman Domination Problem

陈修杨　浙江师范大学

报告摘要：In this paper, firstly, we propose a Roman domination game (RDG) and prove that every Nash equilibrium (NE) of the game corresponds to a strong minimal Roman dominating function (S-RDF), as well as a Pareto-optimal solution. Secondly, we show that RDG is an exact potential game, which guarantees the existence of an NE. Thirdly, we design a game-based synchronous algorithm (GSA), which can be implemented distributively and converge to an NE in rounds, where n is the number of vertices. In GSA, all players make decisions depending on local information. Furthermore, we enhance GSA to be enhanced GSA (EGSA), which converges to a better NE in $O(n^2)$ rounds. Finally, we present numerical simulations to demonstrate that EGSA can obtain a better approximate solution in promising computation time.

专题报告 A6 面向人工智能大模型的最优化方法

5 月 17 日 15:40 – 17:10　三楼 6 号会议室

On Block Coordinate Descent for Training Large Language Models

李肖　香港中文大学（深圳）

报告摘要：This talk concerns memory efficient training of large language models. We will present BAdam, an optimization method that leverages the block coordinate descent (BCD) framework with Adam's update rule. BAdam offers a memory efficient approach to the full parameter finetuning of large language models. We conduct a theoretical convergence analysis for BAdam in the deterministic case. Experimentally, we apply BAdam to finetune the Llama 3-8B and Llama 3-70B models using a single RTX3090-24GB GPU and 4 A100-80GB GPUs, respectively. The results confirm BAdam's efficiency in terms of memory usage, running time, and optimization capability. Furthermore, the downstream performance evaluation based on MT-bench and math benchmarks shows that BAdam outperforms existing memory efficient baselines such as

LoRA. It also demonstrates that BAdam can achieve comparable or even superior performance compared to Adam.

神经网络 Hessian 阵的特性及其对 Adam 分析的应用

孙若愚　香港中文大学（深圳）

报告摘要：本次报告讨论对大型语言模型（LLMs） Hessian 阵的分析，及对算法设计的影响。我们基于 Hessian 阵分析为什么 Adam 在 Transformer 上优于 SGD，并提出一种轻量级的替代方法 Adam-mini。首先，我们解释了 SGD 在 Transformer 上的失败原因：(i) Transformer 是“异质性的”：参数块之间的 Hessian 谱差异显著; (ii) 异质性阻碍了 SGD：SGD 在存在块异质性的问题上表现不佳。受此发现启发，我们引入了 Adam-mini，它为每个块中的所有权重分配了一个单一的二次动量项；相比 Adam 节省了 35-50%的内存，在 8B 规模的语言模型表现出色。其次，我们通过随机矩阵，初步分析了神经网络 Hessian 阵为何具有分块对角的特性，指出分块对角现象出现的一个关键要素。

A Memory Efficient Randomized Subspace Optimization Method for Training Large Language Models

袁坤　北京大学

报告摘要：The memory challenges associated with training Large Language Models (LLMs) have become a critical concern, particularly when using the Adam optimizer. To address this issue, numerous memory-efficient techniques have been proposed, with GaLore standing out as a notable example designed to reduce the memory footprint of optimizer states. However, these approaches do not alleviate the memory burden imposed by activations, rendering them unsuitable for scenarios involving long context sequences or large mini-batches. Moreover, their convergence properties are still not well-understood in the literature. In this work, we introduce a Randomized Subspace Optimization framework for pre-training and fine-tuning LLMs. Our approach decomposes the high-dimensional training problem into a series of lower-dimensional subproblems. At each iteration, a random subspace is selected, and the parameters within that subspace are optimized. This structured reduction in dimensionality allows our method to simultaneously reduce memory usage for both activations and optimizer states. We establish comprehensive convergence guarantees and

derive rates for various scenarios, accommodating different optimization strategies to solve the subproblems. Extensive experiments validate the superior memory and communication efficiency of our method, achieving performance comparable to GaLore and Adam.

专题报告 A7 优化算法软件机器应用

5 月 17 日 15:40 – 17:10　三楼 7 号会议室

Stochastic Bregman Proximal DCA for DC Composite Optimization Problem with Plug-and-Play Applications

吴中明　南京信息工程大学

报告摘要： We propose a stochastic Bregman difference-of-convex algorithm (DCA) for a class of difference-of-convex (DC) structured optimization problems, which minimizes a DC function along with a potentially non-convex function. The novel method integrates the stochastic gradient and inertial strategy into the classic DCA. Both the subsequential and global convergence of the inertial stochastic Bregman DCA are established. Furthermore, we introduce a plug-and-play variant, which utilizes a deep neural network-based prior, offering greater flexibility and robustness while ensuring theoretical convergence. Then, we prove that the Gaussian gradient step denoiser employed in our method is equivalent to evaluating the Bregman proximal operator for an implicitly weakly convex functional. Moreover, we thoroughly validate our method in applications involving Rician noise and phase retrieval. The results demonstrate that the proposed method outperforms existing state-of-the-art methods.

Generalized Heavy-Ball Methods for Machine Learning

黄亚魁　西安电子科技大学

报告摘要： The Heavy-Ball (HB) method is an optimal method for minimizing convex quadratic functions, and has achieved remarkable practical success in modern machine learning applications. In this talk, we conduct a meticulous analysis of historical gradient coefficients in HB, leading to the proposal of a generalized heavy-ball (GHB) method that incorporates two momentums. Our theoretical analysis demonstrates that GHB achieves provable acceleration on convex quadratic functions. We further establish its sublinear convergence for general convex functions and prove linear convergence guarantees under strong

convexity and the Polyak-Lojasiewicz inequality, respectively. By adopting the idea of Polyak stepsize, we design an adaptive stepsize for GHB, resulting in a variant named GHBP. Further, for large scale machine learning problems, we extend our approach to stochastic settings through SGHB and SGHBP. Numerical results are presented to demonstrate the effeciency of our proposed methods.

Removing Impulsive Noise for Unsourced Massive Random Access via A Practical Inexact ADMM

陈艳男　华南师范大学

报告摘要：Unsourced massive random access manages simultaneously a massive number of uncoordinated and bursty transmitters with a single receiver. Many traditional nonlinear least squares decoders at the receiver are inadequate and perform poorly for low signal-to-noise ratio cases, especially for impulsive (non-Gaussian) noises. In this talk, to deal with these heavy-tailed impulsive noises, we first propose a novel l_1 -norm based tensor optimization model for decoding active users' symbols at the receiver. Then, we introduce a practical alternating direction method of multipliers (ADMM) equipped with a novel inexact strategy for dealing with a class of nonconvex and nonsmooth composite optimization problems. It is noteworthy that our new algorithm can efficiently alleviate the computational burden caused by the composite objective with a nonsmooth outer function and a nonlinear inner part. Theoretically, under some standard conditions, we analyze the global convergence of the proposed practical ADMM. Numerical experiments on unsourced massive random access with up to 1000 active users illustrate that the proposed l_1-norm based optimization model and the newly introduced ADMM work well in practice.

专题报告 A8 整数规划

5 月 17 日 15:40 – 17:10　三楼 8 号会议室

大规模整数规划求解算法思考

雷震东　华为公司

报告摘要：整数规划问题在工业中有重要的作用，例如供应链，半导体制造等。而随着工业发展，生产规模增加等，实际的工业问题对求解器在求解规模和性能上的要求越来越高，因此需要更加高效的

求解算法。本报告主要介绍主流的整数规划求解算法以及瓶颈，并介绍一些可能的优化思路和方向。

敏迭优化求解器（MindOpt）技术与应用进展

王孟昌　阿里巴巴达摩院

报告摘要：敏迭优化求解器（MindOpt）是阿里巴巴达摩院自主研发的商用优化求解器，自 2020 年发布首个版本以来，以历经 5 年的持续研发，在求解功能和效率上都取得了长足的进展，并在多个场景落地，成为支撑多个业务的关键基础工具。本报告将介绍敏迭优化求解器（MindOpt）最新的研究和应用进展，特别是整数规划方面的研究与应用。

杉数求解器最新研发进展

皇甫琦　杉数科技

报告摘要：杉数求解器 COPT 是杉数科技自主研发的针对大规模优化问题的高效数学规划求解器套件。COPT 提供大规模混合整数规划、线性规划（单纯形法、内点法和一阶算法）、半定规划、（混合整数）二阶锥规划、（混合整数）凸二次规划、（混合整数）凸二次约束规划、指数锥规划和非线性规划等问题的求解功能。在这次报告中，我们讲重点汇报近期 COPT 整数规划求解器的近期研发进展。

专题报告 A9 近似算法

5 月 17 日 15:40 – 17:10　三楼 9 号会议室

Stability and Fairness Concepts in Facility Location and Clustering Problems

王晨豪　北京师范大学（珠海）

报告摘要： In a facility location problem, a set of facilities is to be built to serve spatially distributed customers. Recently, many works have focused on allocating these facilities in a fair and stable way. In this talk, we introduce two solution concepts: core fairness and popularity. Roughly, the core fairness of a

solution requires that no coalition of agents, large enough in number, can collectively reduce their total distance to the facilities by deviating to a different location. The popularity, on the other hand, ensures that no unselected candidate location is more preferred than any selected facility. We study the existence, computability, and approximability of solutions under these two concepts.

An Improved Approximation Algorithm for the Minimum k-Star Partition Problem

余炜　华东理工大学

报告摘要： Given an undirected graph $G=(V,E)$, the minimum k-star partition problem is to find a collection of vertex-disjoint stars containing at most k vertices to cover all the vertices of V. The objective is to minimize the number of stars in the collection. In this paper, we give a local search algorithm which achieves an approximation ratio of $\frac{k^3+k^2-2k+4}{2k(k+1)}$ when $k \geq 5$ is even and $\frac{k^3-k+2}{2k^2}$ when $k \geq 5$ is odd. This improves on the previous best $\frac{k}{2}$-approximation algorithm implied by Hell and Kirkpatrick for each $k \geq 5$. In addition, we give examples to show that our analysis is tight.

A Parallel Algorithm for Minimum Weight Set Cover with Small Neighborhood Property

冉颖丽　浙江师范大学

报告摘要： This paper studies the minimum weight set cover (MinWSC) problem with a small neighborhood cover (SNC) property proposed by Agarwal et al. in \cite{Agarwal.}. A parallel algorithm for MinWSC with τ-SNC property is presented, obtaining approximation ratio $\tau(1+3\varepsilon)$ in $O\left(L\log_{1+\varepsilon}\frac{n^3}{\varepsilon^2}+4\tau^3 2^\tau L^2\log n\right)$ rounds, where $0<\varepsilon<\frac{1}{2}$ is a constant, n is the number of elements, and L is a parameter related to SNC property. Our results not only improve the approximation ratio obtained in \cite{Agarwal.}, but also answer two questions proposed in \cite{Agarwal.}.

专题报告 A10 大数据统计优化

5 月 17 日 15:40-17:10　二楼悦贵 3 厅

Mini-batch Gradient Descent with Buffer

亓颢博　北京师范大学

报告摘要：In this paper, we studied a buffered mini-batch gradient descent (BMGD) algorithm for training complex model on massive datasets. The algorithm studied in this paper contains two steps: the buffering step and the computation step. In the buffering step, a large batch of data (i.e., a buffer) are loaded from the hard drive to the graphical memory of GPU. In the computation step, a standard mini-batch gradient descent (MGD) algorithm is applied to the buffered data. We first investigate the theoretical properties of BMGD algorithms under the Polyak-Lojasiewicz loss function class. The theoretical claims about the BMGD algorithm are numerically verified by simulation studies. The practical usefulness of the proposed method is demonstrated by three image-related real data analysis.

Optimal Multi-Machine Learning Assisted Semi-Supervised Inference

贺百花　中国科学技术大学

报告摘要：Statistical inference is a fundamental problem with broad applications across fields such as biomedical research, economic analysis, and quality control. Recently, AI or ML-labeled synthetic data has emerged as a powerful tool for reducing the need for human annotations, offering innovative solutions to semi-supervised learning challenges. However, existing methods have yet to fully exploit the predictive power of diverse machine learning models. In this paper, we propose an efficient, robust, and reliable strategy to address the problem of constructing confidence intervals. Additionally, our framework provides a principled approach to constructing estimation intervals that account for shifts in the covariate distribution between labeled and unlabeled data. We further illustrate the effectiveness of our method through experiments on both synthetic and real-world datasets.

Estimation and Inference for Density-Convoluted Support Vector Machine with Streaming Data

郭旭　北京师范大学

报告摘要： In this paper, we investigate estimation and inference problems for the density-convoluted support vector machine (DCSVM) coefficients with high-dimensional streaming data. We first propose an online lasso estimator which can be obtained by optimizing a surrogate loss function. Instead of using complete historical data, the surrogate loss function uses a renewable quadratic form to approximate historical information. As a result, the estimation procedure only requires newly arrived data and limited historical information, which can be updated in an online manner and also is storage-friendly. We derive the theoretical error bounds of the proposed online lasso estimator under mild conditions. To eliminate the inherent bias of the lasso estimator, we further propose an online debiased lasso estimator and construct a valid inference procedure. We establish the asymptotic normality of the debiased estimator.

专题报告 B1 流形优化理论、算法与应用

5 月 18 日 13:30 – 15:00　三楼 1 号会议室

Manifold Identification of Sparse Problem over the Stiefel Manifold

陈士祥　中国科学技术大学

报告摘要： In this talk, we will discuss manifold identification for the l1-regularization problem on the Stiefel manifold. First, we will demonstrate that the intersection of the identified manifold with the Stiefel manifold forms a submanifold. Building on this, we will propose a novel second-order retraction-based algorithm specifically designed for the intersected submanifold. Numerical experiments confirm that the new algorithm exhibits superlinear convergence.

Developing Lagrangian-based Methods for Nonsmooth Nonconvex Optimization

肖纳川　　香港中文大学（深圳）

报告摘要： In this talk, we consider the minimization of a nonsmooth nonconvex objective function $f(x)$ over a closed convex subset $\mathcal{X}$ of $\mathbb{R}^n$, with additional nonsmooth nonconvex constraints $c(x) = 0$. We develop a unified framework for developing Lagrangian-based methods, which takes a single-step update to the primal variables by some subgradient methods in each iteration. These subgradient methods are "embedded" into our framework, in the sense that they are incorporated as black-box updates to the primal variables. We prove that our proposed framework inherits the global convergence guarantees from these embedded subgradient methods under mild conditions. Preliminary numerical experiments on deep learning tasks illustrate that our proposed framework yields efficient variants of Lagrangian-based methods with convergence guarantees for nonconvex nonsmooth constrained optimization problems.

流形上非光滑问题的随机算法

邓康康　　国防科技大学

报告摘要： This talk focuses on a general nonsmooth optimization problem of expectation (online) minimization over a Riemannian manifold. We propose a Riemannian stochastic Homotopy smoothing method, which combines the Moreau envelope technique with the variance reduction method. It is proved that the proposed method achieves an iteration complexity of $\mathcal{O}(\epsilon^{-3})$ to find an ϵ-stationary point. More importantly, our method requires only $\mathcal{O}(1)$ gradient evaluations per iteration and does not require restarting with a large-batch gradient. We also consider the case where h is an indicator function over a convex set. Under a mild error bound condition with parameter $\theta \geq 1$, we establish a iteration complexity of $\widetilde{\mathcal{O}}(\epsilon^{-\max\theta+2,2\theta})$.

专题报告 B2 多目标优化理论、算法与应用

5 月 18 日 13:30 – 15:00　三楼 2 号会议室

Preference-Based Branch and Bound Algorithms for Multiobjective Optimization

吴唯钿　宁波工程学院

报告摘要： Branch and bound algorithms are one of the effective methods for solving multiobjective optimization problems. However, most of the multiobjective branch and bound algorithms aim at approximating the complete Pareto optimal solution set, which makes these algorithms not only computationally expensive, but also easy to put the decision maker in a decision dilemma. In order to compensate for the above shortcomings, we introduce the decision maker's preference information into the multi objective branch and bound algorithms to provide the decision maker with partial Pareto optimal solutions that directly match his/her preferences. We mainly consider additional preference information in the form of ordering cones and reference points, and design the corresponding branch and bound algorithms. Numerical experiments verify the effectiveness of the algorithms.

Gradient Methods in Multiobjective Optimization: A Majorization-Minimization Perspective

陈健　重庆师范大学

报告摘要： Over the past two decades, multiobjective gradient methods have gained increasing attention within the multiobjective optimization community. However, both theoretical and empirical results indicate that even for well-conditioned problems, multiobjective first-order methods exhibit slow convergence due to objective imbalances. On the other hand, multiobjective second-order methods often face difficulties in balancing per-iteration costs with overall performance. In this talk, we will address these challenges from a majorization-minimization perspective.

Recent Advances in Proximal Gradient Method for Multiobjective Optimization

赵晓芃　天津工业大学

报告摘要： We consider a proximal gradient method for unconstrained nondifferentiable multiobjective optimization problems, where the components of the objective function are the sum of a proper lower semicontinuous function and a continuously differentiable function. The convergence rate of the proposed method is analyzed when the smooth component function in the objective function is non-convex, convex, and strongly convex, respectively. Particularly, when the problem is convex, by adopting a typical line search procedure, we propose another proximal gradient method without the Lipschitz continuity of the gradients of the smooth part of the objective function. Also, the accelerated version of the proposed approach based on the Nesterov step strategy is considered and the improved convergence rate is obtained. Numerical implementation strategies and performance profiles of the proposed methods on the considered problem involving l_1-norm and indicator function are also provided.

专题报告 B3 信号处理中的优化

5 月 18 日 13:30 – 15:00　三楼 3 号会议室

面向网络优化的在地化统计信道建模

张纵辉　香港中文大学（深圳）

报告摘要：本地化信道建模对于无线网络的离线性能优化至关重要，但现有信道模型并不完全适用于无线网络优化。本文提出了一种基于物理机制与数据驱动的本地化统计信道模型，专门用于无线网络优化。该模型仅依赖参考信号接收功率（RSRP）进行构建，其核心在于建立 RSRP 与角功率谱（APS）之间的统计关联。基于此关联，我们将信道建模任务转化为稀疏恢复问题，其中 APS 的非零元素表征信道路径的功率及离开角。尽管此类问题通常可通过正交匹配追踪（OMP）类算法处理，但由于系数矩阵存在非均匀且紧密平行的列向量，使得本问题更具挑战性。为此，我们提出加权非负 OMP（WNOMP）算法和基于二阶统计量的 WNOMP（SWOMP）算法。WNOMP 能够缓解非均匀列向量的影响，而 SWOMP 可进一步准确识别紧密平行的列向量。最后，基于合成数据与真实 RSRP 数据的综合实验表明，所提方法在精度与平均绝对误差（MAE）上均优于传统方法。

Local Geometry Determines Global Landscape in Low-Rank Factorization for Synchronization

凌舒扬　上海纽约大学

报告摘要：The orthogonal group synchronization problem, which focuses on recovering orthogonal group elements from their corrupted pairwise measurements. The semidefinite relaxation (SDR) has proven its power in solving this problem; however, its expensive computational costs impede its widespread practical applications. We consider the Burer-Monteiro factorization, a scalable low-rank method to solve large scale SDPs. Despite the significant empirical successes, it is still a challenging task to understand when the nonconvex optimization landscape is benign. We demonstrate that if the degree of freedom within the factorization exceeds twice the condition number of the Laplacian at the global minimizer, the optimization landscape is absent of spurious local minima. Our main theorem is purely algebraic and versatile, and it seamlessly applies to many examples: the nonconvex landscape remains benign under almost identical condition that enables the success of the SDR.

面向低空安全通信的感通导一体化资源优化方法

魏志强　西安交通大学

报告摘要：针对低空无人机通信中的物理层安全挑战，本报告汇报一种感知、导航与通信一体化（Integrated Sensing, Navigation and Communications，ISNC）方案，通过复用通信无人机传输的人工噪声，同时实现对窃听无人机的感知与干扰，保障地面用户的安全通信服务。感通导资源的联合优化设计是一个高度耦合的动态规划问题。本报告将汇报三种联合优化设计方法：1）将原问题近似和解耦，基于传统凸优化方法求解；2）将原问题直接建模问马尔可夫决策过程，基于深度强化学习方法求解；3）将原问题部分解耦，并建模为马尔可夫决策过程，基于深度强化学习和凸优化耦合求解。本报告将对比三种求解方法，并指出深度强化学习和凸优化的耦合求解方法获得了更好的安全通信性能。其内在原因是该方法既能利用深度强化学习强大的在线学习和建模能力，又能保持凸优化方法高精度求解的优势。

专题报告 B4 全局优化

5 月 18 日 13:30 – 15:00　三楼上海厅

A New MISDP/MISOCP Relaxation for AC Optimal Transmission Switching

邓智斌　　中国科学院大学

报告摘要：输电线路开关操作是降低电力系统运行成本与提升灵活性的关键手段，然而交流最优传输开关问题因其混合整数非线性复杂性，其求解仍极具挑战性。本报告介绍一种新型混合整数半正定规划松弛方法。我们主要通过利用两个复变量乘积的凸包并结合相位差约束推导出该凸松弛。此外，该方法可进一步推广至现有混合整数二阶锥松弛的改进。在 NESTA 测试案例上的实验表明，所提出的松弛相较于现有松弛的效果显著提升。

广义凸乘积规划问题的一种新型分支定界算法

岑小丽　　太原师范学院

报告摘要：我们提出了一种新型分支定界算法，用于求解定义在凸集上的广义凸乘积规划问题，其目标函数由一个凸函数与两个凸函数的乘积之和构成。我们将该问题转化为单变量优化问题，进而利用基于显式下界的分支定界算法解之。与 Konno 等人提出的外逼近算法以及 Gurobi 相比，该算法在求解效率上表现出显著优势。

Multi-View Learning with Enhanced Multi-Weight Vector Projection Support Vector Machine

闫辛　　上海对外经贸大学

报告摘要：Multi-view learning aims on learning from the data represented by multiple distinct feature sets. However, the existed methods often face the problems of long processing time or weak generalization on some complex datasets. In this paper, two multi-view enhanced multi-weight vector projection support vector

machine models are proposed. One is a ratio form of multi-view enhanced multi-weight vector projection support vector machine (R-MvEMV), while the other is a difference form (D-MvEMV). Instead of searching for specific classification hyperplanes, each proposed model tries to generate two projection matrices composed of a set of projection vectors for each view. R-MvEMV and D-MvEMV can be simplified to two generalized eigenvalue problems and two eigenvalue problems, respectively. Some numerical results show the better classification performance and higher efficiency of the proposed methods.

专题报告 B5 博弈与优化

5 月 18 日 13:30 – 15:00　三楼 5 号会议室

Selfish Bin Packing: New Models and Cost-sharing Mechanism

盖玲　上海理工大学

报告摘要： This talk delves into mechanism design and equilibrium analysis in bin packing games, where selfish agents strategically optimize their utilities under resource constraints. We first explore the bin packing game with locations, designing strategy-proof mechanisms to address private information with approximation ratios between [1.691, 2] and [5/3, 7/4]. Further, we analyze the selfish bin packing with punishment, demonstrating how result-based dissuasive penalties reduce the Price of Anarchy (PoA) to ≈1.48, outperforming behavior-dependent penalties. Finally, we extend to the open-end bin packing games, proving Nash equilibrium existence and tight PoA bounds for general, minimum, and conflict-aware variants, where conflict graphs model item incompatibility. These theoretical insights bridge the balance between incentivizing truthfulness and minimizing social cost.

Order Acceptance and Scheduling with Weighted Makespan

录岭法　郑州大学

报告摘要： In this paper, we study eight order acceptance and scheduling (OAS) problems by considering job splitting, a fixed number of distinct processing times, weights or rejection costs, and position-dependent processing times, weights or rejection costs, respectively. The objective is to minimize the weighted makespan (maximum weighted completion time) of the accepted jobs plus the total rejection cost of the

rejected jobs. We show that three of the eight OAS problems can be solved in polynomial time, another three of the eight OAS problems are NP-hard, but the computational complexities of the remaining two OAS problems are open. For each of those three NP-hard problems, we propose a pseudo-polynomial-time dynamic programming algorithm and an efficient approximation algorithm. Based on the vector trimming technique, we also obtain a fully polynomial time approximation scheme (FPTAS) for each of those NP-hard problems.

Pareto-Scheduling of Two Competing Agents with Their Own Equal Processing Times

陈如冰　　郑州大学

报告摘要：We consider the Pareto-scheduling of two competing agents on a single machine, in which the jobs of each agent have their “own equal processing times” (shortly, OEPT). In the literature, two special versions of the OEPT model, in which the jobs have either unit or equal processing times, have been well studied, where the criteria are given by various regular objective functions without including the late work criteria. This inspires our research by also including the total (weighted) late work as criteria. We show that, for equal processing times, all the problems are binary NP-hard if the criterion of one agent is the total tardiness or the total late work and the criterion of the other agent is either the total tardiness or the total late work or the weighted number of tardy jobs or the total weighted completion time. We further show that most of the problems under the OEPT model are either polynomially solvable or ordinary NP-hard.

专题报告 B6 最优化与大模型

5 月 18 日 13:30 – 15:00　三楼 6 号会议室

OptMATH: A Scalable Bidirectional Data Synthesis Framework for Optimization Modeling

谢中林　　北京大学

报告摘要：高质量优化建模数据集的匮乏严重制约了大型语言模型（LLMs）从自然语言描述（NL）中建模实际优化问题的能力。为此，我们提出了一种可扩展的算法框架，并生成了名为 OptMATH 的

数据集。该框架基于数学公式（MF）构造生成器，并大规模生成具有可控复杂度的问题数据（PD），随后反向生成对应的 NL。我们使用拒绝采样技术来保证 NL 与 PD 之间的一致性，最终构建了 OptMATH 数据集。该测试集难度显著超过现有的 NL4OPT 和 MAMO 数据集。大量实验表明，基于 OptMATH 训练的模型在多个建模基准测试中均表现出色。

Auto-Formulating Dynamic Programming Problems with Large Language Models

周宸宇　上海交通大学

报告摘要：Dynamic programming (DP) is a fundamental method in Operations Research, but formulating DP models has traditionally required expert knowledge of both the problem context and DP techniques. Large Language Models (LLMs) offer the potential to automate this process. However, DP problems pose unique challenges due to their problem-specific nature and the need to interpret implicit information. This makes it difficult to apply existing LLM-based methods developed for other mathematical domains directly to DP problems. We introduce the first benchmark for DP problems, covering a wide range of textbook-level DP problems to enable systematic evaluation. We propose a framework that guides the process from data collection to training LLMs for DP formulation. Our framework markedly boosts open-source LLMs on DP tasks, and the resulting model matches much larger state-of-the-art systems, underscoring the promise of LLM-driven DP automation.

基于进化式智能体工作流的最优化研究

王祥丰　华东师范大学

报告摘要：最优化问题解决应从依赖专家的求解流程转变为进化式智能体工作流技术路线。传统的最优化应用实践严重依赖专家进行问题制定、算法选择、超参数调整等，容易造成瓶颈，从而阻碍先进的最优化理论与方法的落地应用。由基座大模型和演化搜索驱动的进化式智能体工作流可以自主规划由问题、制定、算法和超参数空间组成的优化空间搜索过程。通过云资源调度和 ADMM 参数自适应的案例研究展示了这种范式如何弥合学术创新与工业实施之间的差距。本报告中讨论的新范式挑战了以人为本的优化工作流程现状，提倡采用更具可扩展性、适应性的方法来解决现实世界的最优化问题。

专题报告 B7 随机优化算法

5 月 18 日 13:30 – 15:00　三楼 7 号会议室

深入学习回归问题结构的随机梯度下降算法分析

方聪　北京大学

报告摘要：随机梯度下降算法是求解机器学习问题中的常见算法。在高维学习问题中，随机梯度下降算法的迭代次数往往低于模型参数量，算法对于模型的产生隐式正则效应是模型能够快速学习泛化的主要原因。本次讲座，我们将研究随机梯度下降算法在不同学习情境下求解线性与简单非线性模型的收敛速度，并进行定量比较。在线性模型中，我们将分别讨论算法在不同学习尺度（即样本数与问题维度不同依赖关系）与协变量偏移条件下的学习效率，尝试理解算法对于学习问题的适应性与涌现发生的条件。在非线性模型，我们将阐明算法能够自适应问题结构，突破一阶算法在离线情形下面临的统计-计算鸿沟（statistical to computational gap）诅咒，并能够自动实现统计推断。

Smooth Approximation Methods for Weakly Convex Optimization

邓琪　上海交通大学

报告摘要：Standard complexity analyses for nonsmooth weakly convex optimization typically employ the Moreau-envelope framework of Davis and Drusvyatskiy (2019), which demonstrates that proximal subgradient, proximal point, and their stochastic variants effectively minimize an implicit smooth surrogate. To complement this, we introduce a new class of smoothable functions, extending classical convex smoothing paradigms (Nesterov, 2005; Beck & Teboulle, 2012). Our unified framework subsumes Nesterov's composition smoothing, Moreau-envelope smoothing and enables the development of fast gradient based algorithms for deterministic or stochastic weakly convex problems.

Dimension Reduction in Stochastic Gradient Descent

梁经纬　上海交通大学

报告摘要： Sparsity-promoting regularizers are widely used to impose low-complexity structure (e.g., l1-norm for sparsity) to the regression coefficients of supervised learning. In the realm of deterministic optimization, the sequence generated by iterative algorithms (such as proximal gradient descent) exhibit "finite activity identification" property, that is, they can identify the low-complexity structure of the solution in a finite number of iterations. However, many online algorithms (such as proximal stochastic gradient descent) do not have this property owing to the vanishing step-size and nonvanishing variance. In this talk, I will show that by combining with a screening rule, we can eliminate useless features of the iterates generated by online algorithms, and thereby enforce finite sparsity identification. One advantage of our scheme is that when combined with any convergent online algorithm, sparsity properties imposed by the regularizer can be exploited to improve computational efficiency. Numerically, significant acceleration can be obtained.

专题报告 B8 随机一阶算法

5 月 18 日 13:30 – 15:00　三楼 8 号会议室

Cubic Regularized Newton Methods with Stochastic Hessian Evaluations and Momentum-Based Variance Reduction

彭拯　湘潭大学

报告摘要： In this work, we introduce a new variant of the cubic regularized Newton method, which does not require exact evaluation of the Hessian but relaxes it to stochastic evaluations with Polyak momentum and recursive momentum. This relaxation reduces the per-iteration costs of second-order methods and allows for greater flexibility in incorporating second-order information into optimization algorithm design. We establish the worst-case iteration complexity of $\widetilde{\mathcal{O}}(\max\{\epsilon_g^{-7/4}, \epsilon_H^{-7}\})$ (Polyak momentum) and $\widetilde{\mathcal{O}}(\max\{\epsilon_g^{-5/3}, \epsilon_H^{-5}\})$ (recursive momentum) for finding an $(\epsilon_g^{3/2}, \epsilon_H^{3})$-second-order stationary points. To the best of our knowledge, this is the first second-order method which rely on exact gradient computation and stochastic Hessian estimator, can still achieve better complexity than first-order methods.

Preference Robust Optimization

郭少艳　大连理工大学

报告摘要：Preference robust optimization concerns decision making problems where the decision maker's utility or risk preference is ambiguous and the optimal decision is based on the worst case utility function or risk measure from a set constructed with available information. This talk will discuss some PRO models, computational schemes and underlying theory.

Preconditioned Inexact Stochastic ADMM for Deep Model

周声龙　北京交通大学

报告摘要： The recent advancement of foundation models (FMs) has brought about a paradigm shift, revolutionizing various sectors worldwide. The popular optimizers used to train these models are stochastic gradient descent-based algorithms, which face inherent limitations, such as slow convergence and stringent assumptions for convergence. In particular, data heterogeneity arising from distributed settings poses significant challenges to their theoretical and numerical performance. This paper develops an algorithm, PISA (Preconditioned Inexact Stochastic Alternating Direction Method of Multipliers), which enables scalable parallel computing and supports various second-moment schemes. Grounded in rigorous theoretical guarantees, the algorithm converges under the sole assumption of Lipschitz continuity of the gradient, thereby removing the need for other conditions commonly imposed by stochastic methods. This capability enables PISA to tackle the challenge of data heterogeneity effectively. Comprehensive vision language models, reinforcement learning models, generative adversarial networks, and recurrent neural networks, demonstrate its superior numerical performance compared to various state-of-the-art optimizers.

专题报告 B9 组合优化

5 月 18 日 13:30 – 15:00　三楼 9 号会议室

On the Approximate Core and Nucleon of Flow Games

肖汉　　中国海洋大学

报告摘要：论文研究了有公共弧线的流博弈中的两个解概念：近似核心和核子。近似核心是经典概念核心（core）的推广。它允许每个联盟都有一个相对报酬偏差；而核子则是经典概念核仁（nucleolus）的乘法类似物。它在字典序下最大化以非递减顺序排列的每个联盟的相对报酬偏差向量。通过引入部分弧不交路，论文给出了近似核心最优近似比与多面体结构的完整刻画，并证明了核子可以在多项式时间内计算。

Experimental Design Using Interlacing Polynomials

周宏　　福州大学

报告摘要：We present a unified deterministic approach for experimental design problems using the method of interlacing polynomials. Our framework recovers the best-known approximation guarantees for the well-studied D/A/E-design problems with simple analysis. Furthermore, we obtain improved non-trivial approximation guarantee for E-design in the challenging small budget regime. Additionally, our approach provides an optimal approximation guarantee for a generalized ratio objective that generalizes both D-design and A-design.

Approximating Competitive Equilibrium by Nash Welfare

陶亦心　　上海财经大学

报告摘要：我们研究了可分配物品的两种经典分配概念之间的关系：竞争均衡（CE）和最大纳什福利分配，即加权几何平均效用最大化的分配。当所有代理的效用函数都是齐次的时，这两者是一致的——经典的 Eisenberg-Gale 凸规划在可行分配上既能最大化纳什福利，又能产生竞争均衡。然而，在非齐次效用函数的情况下，这两种分配可能会有所不同。

从计算角度来看，最大化纳什福利在任意凹效用函数下都是一个凸优化问题，而计算 CE 即使在可分的分段线性凹（SPLC）效用函数下也是 PPAD 困难的。为此，我们引入了 Gale-substitutes 效用函数的概念，这一概念是对 Gale 需求系统下 substitutes 性质的推广。对于 Gale-substitutes 效用函数，我们证明了最大纳什福利分配能够提供强保证的近似 CE：每个代理至少获得其在任何 CE 下最大可得效用的一半，并且满足 2-envy-free 性质。此外，Gale-substitutes 效用函数的适用范围广泛，包括计算 CE 为 PPAD 困难的效用类别，如所有 SPLC 效用函数，以及此前研究的 Leontief-free 效用函数。

我们进一步提出了一类基于广义流模型的广义网络效用函数，这一类别涵盖 SPLC 和 Leontief-free 效用函数，并证明所有这些函数都属于 Gale-substitutes 类。另一方面，尽管某些代理在最大纳什福利分配下可能获得远高于 CE 的效用，我们仍然证明了一个类似于 price of anarchy 的结果：对于一般凹效用函数，任何 CE 至少能达到最大纳什福利的 (1/e)(1/e)≈0.69 倍，并且这一界是最优的。

专题报告 B10 大数据统计优化

5 月 18 日 13:30 – 15:00　二楼悦贵 3 厅

Distributional Off-Policy Evaluation with Deep Quantile Process Regression

周帆　　上海财经大学

报告摘要：This paper investigates the off-policy evaluation (OPE) problem from a distributional perspective, with the aim of modeling the entire distribution of total returns, rather than focusing solely on estimating the expectation (value function), as most existing OPE methods do. Specifically, we introduce a quantile-based approach for OPE using deep quantile process regression, presenting a novel algorithm called Deep Quantile Process regression-based Off-Policy Evaluation (DQPOPE). We provide new theoretical insights into the deep quantile process regression technique, extending existing approaches that estimate discrete quantiles to estimate a continuous quantile function. A key contribution of our work is the rigorous sample complexity analysis for distributional OPE with deep neural networks, bridging theoretical analysis with practical algorithmic implementations.

Communication-Efficient and Distributed-Oracle Estimation for High-Dimensional Quantile Regression

杨松山　　中国人民大学统计与大数据研究院

报告摘要： In this article, we present a novel communication-efficient estimator for distributed high-dimensional quantile regression with folded-concave penalties. An iterative multi-step (IM) algorithm is employed to tackle the nonconvex challenge of the objective function, taking into account both the statistical accuracy and the communication constraints. We demonstrate that the proposed IM estimators share similar properties with the global folded-concave penalized estimator. To establish the theoretical results, we introduce a new concept called *distributed-oracle estimator*. We prove that the proposed estimator converges to the distributed-oracle estimator with high probability. Compared to the l_1-penalized method, the IM estimator possesses a faster rate of convergence and requires milder conditions to achieve support recovery. Furthermore, we extend our framework to facilitate distributed inference for the preconceived low-dimensional components within the high-dimensional model. We derive the limiting distribution of the corresponding test statistic under the null hypothesis and the local alternatives. In addition, a new feature-splitting algorithm is devised to accommodate the high-dimensional data within the distributed system. Extensive numerical studies demonstrate the effectiveness and validity of our proposed estimation and inference methods. A real example is also presented for illustration.

Optimization Agent: A Novel Two-sided Optimization Framework via Strategic Limit Theory

严晓东　　西安交通大学

报告摘要：This paper proposes a unified framework for the global optimization of a continuous function in a bounded rectangular domain. Specifically, we show that, under the optimal strategy for a two-armed decision model, the sample mean converges to a global optimizer under the Strategic Law of Large Numbers. Motivated by this result, we propose a novel class of Strategic Monte Carlo Optimization (SMCO) algorithms, which uses a simple strategy that makes coordinate-wise two-armed decisions based on the signs of the partial gradient. While this simple strategy is not generally optimal, we show that it is sufficient for our SMCO algorithm to converge to local optimizer(s) almost surely from a single starting point, and to global

optimizers under a growing set of starting points. Numerical studies demonstrate the suitability of our SMCO algorithm for global optimization well beyond our theoretical results. For a wide range of test functions with challenging optimization landscapes (including ReLU neural networks with square and hinge loss), our SMCO algorithms converge to the global maximum accurately, fast, and robustly, using only a small set of starting points (at most 100 for dimensions up to 1000) and a small number of maximum iterations (200). In fact, our algorithms outperform many state-of-the-art global optimizers, as well as local algorithms augmented with the same set of starting points as ours.

专题报告 B11 双层优化方法及应用

5 月 18 日 13:30 – 15:00　三楼 11 号会议室

Generalized-Smooth Bilevel Optimization with Nonconvex Lower-Level

黄飞虎　南京航空航天大学

报告摘要：Bilevel optimization is widely applied in many machine learning tasks such as hyper-parameter learning and meta learning. Although many algorithms have been proposed to solve the bilevel optimization problems, they rely on the smoothness condition of objectives. More recently, some methods have begun to study generalized smooth bilevel optimization. However, these methods only focus on the (strongly) convex lower objectives and generalized-smooth upper-level objective, but still require the standard smooth lower-level objective. In the paper, we study the generalized-smooth bilevel optimization with the nonconvex lower-level objective, where both upper-level and lower-level objectives are generalized-smooth. We propose an efficient Hessian/Jacobian-free penalty normalized gradient (i.e., PNGBiO) method. Moreover, we prove that our PNGBiO method obtains a low gradient complexity. Some experimental results demonstrate efficiency of our proposed method.

An Infinite-Dimensional Duality Theory with Applications to Moral Hazard

柯荣住　浙江大学

报告摘要： Moral hazard models have become ubiquitous in management science despite their inherent mathematical challenges. These models constitute a class of nonlinear, bilevel, infinite-dimensional

optimization problems that exhibit special properties, permitting structural characterizations under certain – often quite restrictive – assumptions. In this study, we investigate milder conditions that nevertheless yield analytical characterizations of optimal contracts while preserving contract continuity. Our methodological contribution centers on a novel infinite-dimensional duality theorem for nonconvex optimization problems in function spaces. Crucially, this duality result depends on concavity properties of the Lagrangian function rather than requiring differentiability or convexity of either the objective function or the constraints.

Gradient-Based Algorithms for Bilevel Optimization and Applications

尧伟　南方科技大学

报告摘要：This talk will explore recent advancements in gradient-based algorithms for bilevel optimization problems, as well as their applications in machine learning. First, we introduce several efficient implicit gradient-based algorithms that achieve optimal sample complexity when the lower-level problem is strongly convex. For more challenging scenarios involving non-uniqueness or constraints, we discuss gap function-based methods that guarantee provable convergence using only first-order gradient information. Notably, these methods can be efficiently implemented in a single-loop structure, making them highly suitable for large-scale applications.

专题报告 B12 随机优化

5 月 18 日 13:30 – 15:00　二楼悦贵 1 厅

A Localized Progressive Hedging Algorithm for Solving Nonmonotone Stochastic Variational Inequalities

张立平　清华大学

报告摘要：The progressive hedging algorithm (PHA) is an effective solution method for solving monotone stochastic variational inequalities (SVI). However, this validity is based on the assumption of the global maximal monotonicity. In this talk, we propose a localized PHA for solving nonmonotone SVI and show that its validity is based on the weaker assumption of locally elicitable maximal monotonicity. Furthermore, we

prove that such assumption holds when the involved mapping in the SVI is locally elicitable monotone or locally monotone. The local convergence of the proposed algorithm is established, and it is shown that the localized PHA has the rate of linear convergence under some mild assumptions. Some numerical experiments including a two-stage orange market problem and randomly generated two-stage piecewise stochastic linear complementarity problems indicate that the proposed algorithm is efficient.

Stochastic Zeroth-order Methods for Stochastic Nonsmooth Multiobjective Optimization with Parameterized Variational Inequality Constraints

赵勇　　重庆交通大学

报告摘要：This paper investigates a class of stochastic multiobjective optimization problems constrained by parameterized variational inequalities. The constraint mapping is assumed to be strongly monotone, leading to an implicit nonsmooth stochastic multiobjective problem. A key challenge arises from the absence of an oracle to directly evaluate the parameterized variational inequality constraints, rendering conventional zeroth-order optimization frameworks inapplicable. To bridge this gap, we propose a locally randomized zeroth-order algorithm that employs biased gradient approximations for the implicit objective functions. Under mild conditions, we establish the convergence results of the proposed algorithm in the convex and nonconvex cases, respectively. Numerical experiments are conducted to validate the effectiveness of the proposed algorithms.

Stochastic Dominance Constrained MDPs: Tractable Sample Approximations and Convergence Guarantees

刘嘉　西安交通大学

报告摘要：This paper studies an infinite-horizon constrained Markov decision process (MDP) problem with multiple random rewards and ambiguous risk-averse preferences. The MDP problem maximizes the cumulative discounted expected reward satisfying multivariate second-order stochastic dominance (SSD) constraints. We use the occupation measure to reformulate the SSD-constrained MDP as semi-infinite

programming. We proposed a two-level tractable approximation scheme to solve the MDP, based on discrete approximation and sample average approximation. We provide theoretical guarantees for approximation convergence, including quantitative error estimations and quantitative/qualitative convergence results.

专题报告 B13 整数规划

5 月 18 日 13:30 – 15:00　二楼悦贵 2 厅

基于两阶段随机规划的电动汽车换电站选址与运营协同优化：计及新能源不确定性与关税影响

李娜　东华大学

报告摘要：国际贸易摩擦与关税壁垒导致大量动力电池转向国内市场，为电动汽车换电站的应用带来了新的机遇与挑战。换电站不仅是高效的能源补给设施，更可作为整合这些富余电池资源、构建分布式储能系统的关键平台。然而，高昂的投资成本以及可再生能源（特别是光伏）发电的不确定性给换电站网络的经济规划与稳定运营带来显著困难。基于此，本文提出了一种两阶段随机规划模型，旨在协同优化换电站的战略选址与日内经济调度，并显式纳入了光伏发电的不确定性。第一阶段在不确定性信息披露前确定最优建站位置，以最小化年化投资成本，同时基于能量可达性约束确保对需求点的有效覆盖。第二阶段针对一组代表性光伏发电场景，在给定选址方案下优化各站点的运营策略，以最小化预期的总运营成本。该模型为在特定市场环境下，经济有效地规划和利用电池资源的换电站网络提供了决策支持框架。

时间聚合、产品聚合与季节性对牛鞭效应测量的影响

马浩　同济大学

报告摘要：牛鞭效应在供应链管理领域长期受到广泛关注，然而在数据聚合背景下，其测量结果在现有文献中存在显著分歧。本文系统研究了牛鞭比率测量中的三个关键因素：时间聚合、产品聚合与季节性。在时间聚合方面，本文将需求与订单方差分解为子集方差的期望与子集期望的方差两个部分，进一步将牛鞭比率拆解为四个组成要素，从而揭示时间聚合对牛鞭比率测量机制的深层影响。在产品聚合方面，本文分析了在产品需求与订单相互独立或相关的情形下，聚合行为对牛鞭比率的作用机制。

对于季节性因素，本文提出其可被视为一个牛鞭比率为 1 的独立成分，并探讨其对整体牛鞭比率的调节作用。研究发现：（a）时间聚合在不同情境下可能导致牛鞭比率上升、下降或保持不变，挑战了理论研究中时间聚合必然削弱牛鞭效应的观点；（b）对不相关产品，其聚合牛鞭比率为各单品牛鞭比率的加权平均，权重为相应的需求方差；而对相关产品，聚合牛鞭比率可能突破该加权范围；（c）季节性作为结构性成分，其加入可有效将总体牛鞭比率拉近至 1，起到平衡效应的作用。

门诊病人当日转诊调度优化研究

秦圣坤　同济大学

报告摘要：我国综合医院就诊病人众多，当治疗室、恢复室等部门出现较长等待队列时，部分门诊病人会因无法在就诊当日得到治疗而需要再次入院。在医联体模式和转诊制度下，当医院医疗资源紧张无法为全部病患提供治疗时，部分病人可以被转诊到医联体内合作医院进行治疗。结合病人对转诊的接受意愿，提出了考虑病人就医公平性的转诊调度策略，以优化医疗系统的表现。研究问题被建模为混合流水车间，建立了基于场景的随机规划模型并设计求解算法。最后，通过数值实验验证模型和算法的有效性。

关税不确定性下考虑近岸外包策略的供应链韧性提升优化

刘中正　同济大学

报告摘要：由于地缘政治紧张局势加剧和贸易政策波动，供应链面临越来越多的不确定性，特别是关税不确定性。然而，日益增加的关税不确定性对维持供应链韧性构成了重大挑战。近岸外包策略通过将运营地点靠近目标市场以减少关税敞口，已成为提升供应链韧性的重要策略。现有的文献缺乏针对关税引发的扰动下基于邻近溢价策略的供应链韧性研究，特别是聚焦于战略邻近溢价选择的研究。本研究探讨了在关税不确定性下构建供应链韧性的新问题，其中包括：（i）优化近岸外包策略，（ii）优化产品定价决策，（iii）规划生产和分销能力。本研究构建了一个两阶段随机规划模型以最大化总利润，并提出了一种情景缩减算法。通过数值实验评估了所提出方法的有效性，并得出了管理见解。

专题报告 B14 非光滑优化

5 月 18 日 13:30 – 15:00　二楼悦华 1 厅

Optimal Control for a Quasistatic Viscoelastic Contact Problem

蔡冬玲　中国科学院数学与系统科学研究院

报告摘要：In this talk, we focus on an optimal control problem for a quasistatic viscoelastic contact problem with long memory. We establish the existence of weak solution to the contact problem and show the solvability of the optimal control problem.

A Fast Adaptive Bregman Proximal DC Algorithm for DC Optimization Problems

温博　宁波工程学院

报告摘要：In this talk, we consider a class of nonsmooth DC optimization problems. We first propose a fast adaptive Bregman proximal DC algorithm. Then we analyze the convergence behavior of the method. Finally, some numerical tests are done to show the efficiency.

Extrapolated Hard Thresholding Algorithms with Finite Length for Composite L0 Penalized Problems

吴帆　哈尔滨工业大学

报告摘要：For a class of sparse optimization problems with the penalty function of $||(\cdot)_+||_0$, we first characterize its local minimizers and then propose an extrapolated hard thresholding algorithm to solve such problems. We show that the iterates generated by the proposed algorithm with $\epsilon > 0$ (where ϵ is the dry friction coefficient) have finite length, without relying on the Kurdyka-{\L}ojasiewicz inequality. Furthermore, we demonstrate that the algorithm converges to an ϵ-local minimizer of this problem. For the special case that $\epsilon = 0$, we establish that any accumulation point of the iterates is a local minimizer of the

problem. Additionally, we analyze the convergence when an error term is present in the algorithm, showing that the algorithm still converges in the same manner as before, provided that the errors asymptotically approach zero. Finally, we conduct numerical experiments to verify the theoretical results of the proposed algorithm.

专题报告 B15 变分与半变分不等式的理论、方法与应用

5 月 18 日 13:30 – 15:00　二楼悦华 2 厅

Existence and Qualitative Analysis for Three Class of Multivalued Variational-Hemivariational Inequalities

曾生达　　重庆师范大学

报告摘要：The aim of this talk is to give a detailed discussion of existence and qualitative analysis for three classes multivalued variational-hemivariational inequalities which are variational-hemivariational inequalities with multivalued Bresiz pseudomonotone operators, and multivalued quasi-variational -hemivariational inequalities with or without non-self constraint maps.

Dynamic Systems Coupled with Solutions of Stochastic Nonsmooth Convex Optimization

罗建锋　　中北大学

报告摘要：In this talk, we will introduce a work which studies ordinary differential equations (ODE) coupled with solutions of a stochastic nonsmooth convex optimization problem (SNCOP). We use the regularization approach, the sample average approximation and the time-stepping method to construct discrete approximation problems. We show the existence of solutions to the original problem and the discrete problems. Moreover, we show that the optimal solution of the SNCOP with a strong convex objective function admits a linear growth condition and the optimal solution of the regularized SNCOP converges to the least-norm solution of the original SNCOP, which are crucial for us to derive the convergence results of

the discrete problems. We illustrate the theoretical results and applications for the estimation of the time-varying parameters in ODE by numerical examples. Joint work with Prof. Xiaojun Chen (PolyUHK).

A Double Step Rothe Scheme for Hyperbolic Clarke Subdifferential Inclusions Controlled by Evolution Equations

岑金夏　浙江师范大学

报告摘要：In this talk, we introduce a coupled system which consists of a hyperbolic Clarke subdifferential inclusion and an evolution equation in Banach spaces. Using temporally semidiscrete method based on the double step scheme, we construct a discrete approximate system. The existence of solutions and its a-priori estimates for the discrete approximate system are provided by the surjectivity of multivalued pesudomonotone operators and discrete Gronwall's inequality. Finally, we show that the solution sequence of the discrete approximate system converges weakly to a limit element, which is a solution of the coupled original system.

专题报告 C1 流形优化理论、算法与应用

5 月 18 日 15:00 – 16:30　三楼 1 号会议室

机器学习中的黎曼双层优化

高志　北京大学

报告摘要：许多机器学习任务可被建模为黎曼流形上的双层优化问题（Bi-Level Optimization），如黎曼元优化（Riemannian Meta-Optimization）、黎曼元学习（Riemannian meta-learning）和黎曼超参数优化（Riemannian hyperparameter optimization）等。黎曼双层优化是一种分层数学框架，外层优化嵌套了具流形约束的内层优化。其核心思想是在内层循环中优化黎曼参数，在外层通过对内层优化轨迹进行微分，从而实现数据驱动的超参数或神经网络的自动优化。然而，现有黎曼双层优化方法仍面临多项挑战：计算资源消耗大、难以扩展到其他流形或任务、内层优化解不唯一等，严重限制了其在实际中的应用。

为解决这些问题，本文首先提出了一种高效的黎曼隐式微分方法，兼具数值稳定性与低计算成本。传统方法需对整个优化轨迹进行微分，而我们的方法仅依赖于最后两步优化，从而显著降低了计算与

内存开销，并有效避免梯度爆炸。但将隐式微分推广至不同任务并不容易，常常需要针对具体问题进行手工推导。为此，本文进一步提出一种任务无关的黎曼隐式微分框架，为外层梯度提供统一表达形式，极大降低了对专家经验的依赖，提升了方法的泛化性。具体而言，我们将内层优化建模为定点方程的求解问题，并通过对该方程进行微分，统一推导出外层梯度的表达，避免了针对不同任务重复推导的成本。此外，当前方法普遍假设内层优化问题具有唯一解，以确保整体收敛性。但在诸如黎曼神经网络训练等任务中，这一假设往往不成立，且相关研究仍较为匮乏。为此，本文引入了一种新颖的转化策略：将黎曼双层优化问题等价地转化为带惩罚项的单层黎曼最小化问题，并结合增广拉格朗日法与对偶变量的解析解，在理论上证明即使内层解不唯一，算法仍可收敛至原问题的全局最优解。我们对所提出方法进行了严格的收敛性与近似误差分析，理论上保证了其在各类黎曼优化任务中的有效性。实验部分涵盖图像分类、小样本识别与持续学习等多个典型场景，结果显示：相比传统欧氏空间中的双层优化方法，我们的方法不仅表现更优，而且显著减少了人工参与与资源开销，有望推动黎曼双层优化在实际中的落地应用。

The Distributionally Robust Optimization Model of Sparse Principal Component Analysis

王磊　　香港理工大学

报告摘要： We consider sparse principal component analysis (PCA) under a stochastic setting where the underlying probability distribution of the random parameter is uncertain. This problem is formulated as a distributionally robust optimization (DRO) model by capturing uncertainty in the covariance matrix, which constitutes a nonsmooth constrained min-max optimization problem. We further prove that the inner maximization problem admits a closed-form solution, reformulating the original DRO model into an equivalent minimization problem on the Stiefel manifold. To solve the reformulated model, we devise an efficient smoothing manifold proximal gradient algorithm. We prove the global convergence of our algorithm to a stationary point and establish the iteration complexity. Finally, numerical experiments are conducted to validate the effectiveness and scalability of our algorithm, as well as to highlight the necessity and rationality of adopting the DRO model for sparse PCA.

A Stochastic Semismooth Newton Method for Nonsmooth Constrained Optimization on Riemannian Manifolds

杨涛　广西大学

报告摘要： In this talk, we consider a class of optimization problems defined on Riemannian manifolds involving nonconvex objectives composed with nonsmooth terms, subject to general equality and inequality constraints. We propose a stochastic semismooth Newton method with Moreau–Yosida regularization for nonsmooth terms, embedded within a stochastic augmented Lagrangian (AL) framework that incorporates second-order information through stochastic gradient and Hessian approximations. Under mild assumptions, we establish the global convergence of the proposed algorithm using quasi-martingale convergence theory. Furthermore, under additional semismoothness and regularity assumptions, we establish local linear convergence rate.

Stiefel 流形上基于等距算符的量子梳层析

李泽通　香港科技大学（广州）

报告摘要：量子梳（quantum combs）的显式数学重建在量子信息科学领域具有重要意义。然而，重建量子梳所需参数规模较大，物理约束较难实现，成为计算上不可忽视的负担。本工作提出了一种高效的基于等距算符的量子梳层析方法，将原量子梳层析问题转化为在 Stiefel 流形上的一系列小规模无约束问题。值得注意的是，该方法通过缩小等距变换的辅助维度，实现了有界误差下的维度缩减量子梳层析。实验结果展现了显著较高的精度和效率。相较于传统的基于 Choi 态的量子梳层析方法，本方法在目标量子梳辅助维度显著较小时，能够在保证精度的情况下缩短运行时间至 1/100。

专题报告 C2 多目标优化理论、算法与应用

5 月 18 日 15:00 – 16:30　三楼 2 号会议室

Multiobjective Sparse Facility Location Problem

李高西　重庆工商大学

报告摘要： Facility network designers sometimes aim to minimize the number of facilities that provide adequate services to all users, even at the expense of increasing the total cost. To achieve this goal, this paper

proposes a multi-objective sparse facility location model. The objective function of this model includes a sparsity-inducing term, making it a challenging mixed-integer multi-objective programming model to solve. Unlike conventional approaches for solving mixed-integer programming problems, this paper relaxes the mixed-integer multi-objective programming model into a continuous, implicitly smooth, nonlinear multi-objective programming model, which can be solved by standard algorithms. Furthermore, the convergence of the solutions for the relaxed model is also discussed in this paper. Numerical experiments demonstrate that this continuous relaxation approach can effectively obtain integer solutions for the multi-objective sparse facility location model.

Convergence of Inexact Steepest Descent Algorithm for Multiobjective Optimizations on Riemannian Manifolds Without Curvature Constraints

王金华　　杭州师范大学

报告摘要：We study the issue of convergence for inexact steepest descent algorithm (employing general step sizes) for multiobjective optimizations on general Riemannian manifolds (without curvature constraints). Under the assumption of the local convexity/quasiconvexity, local/global convergence results are established. Furthermore, without the assumption of the local convexity/quasi-convexity, but under an error bound-like condition, local/global convergence results and convergence rate estimates are presented, which are new even in the linear space setting. Our results improve/extend the corresponding ones in (Wang et al. in SIAM J Optim 31(1):172–199, 2021) for scalar optimization problems on Riemannian manifolds to multiobjective ones. Finally, for the special case when the inexact steepest descent algorithm employing Armijo rule, our results improve/extend the corresponding ones in (Ferreira et al. in JOptim Theory Appl 184:507–533, 2020) by relaxing curvature constraints.

Optimality Conditions at Infinity in Semialgebraic Vector Optimization

矫立国　　东北师范大学

报告摘要：In this talk, we first introduce certain cones associated with unbounded semialgebraic sets at infinity. Then we establish optimality conditions at infinity in terms of the Newton polyhedra of the objective mappings and of the cones at infinity for semial.

专题报告 C3 信号处理中的优化

5 月 18 日 15:00 – 16:30　三楼 3 号会议室

Efficiently and Globally Solving Joint Beamforming and Compression Problem in the Cooperative Cellular Network via Lagrangian Duality

范熙来　中国科学院数学与系统科学研究院

报告摘要：The cooperative cellular network is a promising network architecture that can effectively mitigate the multi-user interference, where multiple relay-like base stations (BSs) are connected to the central processor via rate-limited fronthaul links and serve the users cooperatively.

RADA: A Flexible Algorithmic Framework for Nonconvex-Linear Minimax Problems on Riemannian Manifolds

徐勐　中国科学院数学与系统科学研究院

报告摘要：In this talk, we focus on the nonconvex-linear minimax problem on Riemannian manifolds, which can be equivalently reformulated as the Riemannian nonsmooth composite problem and finds wide applications in machine learning and signal processing. For solving this class of problems, we propose a flexible Riemannian alternating descent ascent algorithmic framework and prove that the proposed framework achieves the best-known iteration complexity. Various customized simple yet efficient algorithms can be incorporated within the proposed algorithmic framework and applied to different problem scenarios. We also reveal intriguing similarities and differences between the algorithms developed within our proposed framework and existing algorithms, which provide important insights into why the former outperform the latter. Lastly, we report numerical results on sparse PCA, fair PCA, and sparse spectral clustering to demonstrate the superior performance of the proposed algorithms.

边际分布稳健的最小均方估计

宋恩彬　四川大学

报告摘要：本报告研究多传感器系统中随机信号和单个传感器观测的边际概率分布未知情况下，在最不利分布下的边缘不确定性集合中，融合中心如何找到具有最佳性能的估计器的问题，即边际分布稳健最小均方误差估计问题（MDR-MMMSE）。具体地，适应于多传感器系统的不确定性，待估随机信号和单个传感器的观测信号的边际分布不确定性集合由以名义高斯密度为中心，Kullback-Leibler（KL）散度为“距离度量”定义的球形邻域刻画。尽管边际分布稳健最小均方误差估计问题（MDR-MMMSE）是一个无限维优化问题，我们证明了存在仿射估计器和对应的高斯密度构成该问题的鞍点解，并且可以通过解一个有限维的凸优化问题得到该鞍点解。除此之外，我们证明了所有鞍点解具有“部分高斯”和“部分仿射”的性质。更进一步，移除不积极传感器的退化的边际分布稳健最小均方误差估计问题（MDR-MMMSE）的最优估计器对于保留所有传感器的原问题仍然最优，因此可以降低由不积极传感器向融合中心传输观测带来的的通讯负担。我们建立了三种不同的准则用以衡量积极传感器和阈值设定之间的关系。数值实验表明我们所提模型的优越性。

专题报告 C4 全局优化

5 月 18 日 15:00 – 16:30　三楼上海厅

Quadratic Convex Reformulations for a Class of Complex Quadratic Programming Problems

康高健　华北电力大学

报告摘要：本文研究了一类具有单位模和离散相位约束的复二次规划问题。这类问题可以转化为混合整数二次规划问题，并通过商业求解器如 Gurobi 求解。但是当直接将原始模型输入到求解器时，求解器的效率往往不尽人意。为此，本文提出几种二次凸重构方法，以提升求解器性能。我们拓展了经典的对角线扰动重构技术，并利用问题的独特结构，推导出一种新的二次凸重构方法，其连续松弛比对角线扰动方法更紧。随机实例和单模码设计问题的数值测试结果表明，新提出的重构方法具有显著优势。

平稳梯度修正的 RMSProp 在最小二乘问题上的收敛性分析

李润泽　　清华大学

报告摘要：RMSProp 是一种广泛应用于机器学习领域的一阶随机优化算法。报告针对线性最小二乘问题，提出了一种基于小批量随机梯度的平稳梯度修正的 RMSProp（SGA-RMSProp）。在相容的线性最小二乘问题下，证明了该算法是 R-线性收敛的；而对于不相容情况，则证明了该算法 R-线性收敛至最小值点的一个受批量控制的邻域。此外，通过数值实验对比了不同批量下 SGA-RMSProp 与下随机梯度下降算法（SGD）的性能，实验结果显示 SGA-RMSProp 在初始阶段具有更快的收敛速度。进一步地，我们提出了一种自适应切换策略，该策略结合了这两种算法的优点。

非凸优化的随机方向搜索算法研究

张雨暄　　清华大学

报告摘要：直接搜索方法是一类广泛应用于非凸优化的全局算法，其核心特征在于求解时不利用梯度信息。根据搜索策略的差异，直接搜索方法分为三大类：点搜索算法、方向搜索算法及智能优化算法。现有文献中关于点搜索算法和智能优化算法的收敛性、复杂度分析结果较为丰富，而关于方向搜索算法的理论结果则较为匮乏。本文提出了一种面向求解非凸优化问题的随机方向搜索算法（RDSA）。我们证明 RDSA 收敛到全局最优解的性质，并推导了其计算复杂度。此外，我们从提升数值实验表现的角度出发，提出一种带局部搜索的改进算法（IRDSA）。

专题报告 C5 博弈与优化

5 月 18 日 15:00 – 16:30　三楼 5 号会议室

k-替换系统的定义及性质

农庆琴　　中国海洋大学

报告摘要：尽管现有的各类独立系统已经覆盖很多实际问题，但目前已知的独立系统在应用于建模某些实际问题时还存在局限性。例如，k-系统和k-扩展系统仅考虑了均匀性或扩展属性而无法准确捕捉替换需求。为了解决这些局限性，本文引入了一类新的独立系统，称为k-替换系统。这一新型系统关

注通过替换而不是扩展来保持独立性。具体而言，k-替换系统确保在向独立 集添加新元素时，最多移除k个元素，以保持独立性。通过分析k-替换系统的性质，探讨k-替换系统、k-扩展系统和k-系统之间的关系。

Colorful k-clustering

许宜诚　中国科学院深圳先进技术研究院

报告摘要： Clustering has long been a fundamental problem that has attracted research interest in combinatorial optimization and computational geometry over the years. This presentation will focus on recent research mainstream of colorful fair clustering models, motivated by privacy awareness in modern machine learning tasks. We introduce colorful fairness from both facility and client perspectives based on recent work on colorful k-clustering. Our result on colorful sum of radii remains state-of-the-art and colorful k-supplier has been improved to a 3-approximation from ours 5-approximation by Thejaswi et al. very recently, closing the gap under P≠NP.

Time and Energy Driven Online Scheduling Problem in EV Charging

张涌　中国科学院深圳先进技术研究院

报告摘要： Electric vehicles (EVs) become more and more popular, along with the higher and higher efficiency demand for charging scheduling. In this talk, we study the online scheduling problem of EV charging that minimizes the maximum flow time, solving the problem of queuing congestion at charging stations during peak hours. Based on the characteristics of the charging power curve of electric vehicles, we design an online scheduling algorithm for EV charging and prove that the ratio of this algorithm to the optimal offline algorithm is $3.4528(1+\epsilon)$. We analyze and find that the proposed algorithm can adjust the charging time proportionally, allowing the electric vehicle EV to gradually reach the final State of Charge (SOC). According to the battery overheating protection mechanism, charging will stop when the battery level starts to decrease. This method effectively balances the trade-off between time cost and energy intake, significantly improving the queuing situation for charging electric vehicles during peak hours.

专题报告 C6 最优化与大模型

5 月 18 日 15:00 – 16:30　三楼 6 号会议室

Generative Models for Combinatoial Problems

严骏驰　　上海交通大学

报告摘要： Recent studies have highlighted a key performance bottleneck in modeling Combinatorial Optimization (CO) as neural solution prediction tasks. Neural networks, in attempting to minimize the average objective score across a distribution of historical problem instances, often deviate from the primary goal of CO, which is to find optimal solutions for each individual test instance. This calls for an effective search process for each problem instance, with the model providing supporting knowledge to guide the search. To address this, we propose a generative modeling approach that learns the distribution of high-quality solutions for each instance, aiming to capture the fundamental nature of the problem rather than just predicting a single solution point. We introduce the T2T (Training to Testing) framework, based on diffusion models, which first leverages generative modeling during training to estimate the high-quality solution distribution for each instance. During testing, a neural search process exploits the learned solution space through noise-addition and denoising iterations. Additionally, we propose an Optimization Consistency Model that accelerates solution finding by learning a consistency mapping to enable single-step or few-step generation, significantly improving solving speed. We also investigate the inference-time scaling dynamics of diffusion models for optimization problems and demonstrate that our proposed neural search process achieves superior performance, scaling better per computation than extending denoising steps. Building upon this, we design DiffSearch, a method that reallocates computational resources to higher-level iterative refinement cycles, rather than relying on over-parameterized single-round generation. Our method serves as a foundational framework adaptable to various combinatorial optimization problems, and experimental results on problems like TSP and MIS show significant performance improvements over existing learning-based approaches.

大语言模型辅助的优化通用建模与求解初探

钱鸿　　华东师范大学

报告摘要：优化在现实应用中起着举足轻重的作用，相较于发展迅猛的优化问题机器求解算法，优化问题机器自动建模发展较为缓慢，这主要是由于通用优化问题的定义与建模涉及问题理解、抽象、推

理等，往往高度依赖专家知识与经验，建模成本高昂。随着大语言模型的快速发展，其在知识理解与推理方面表现出良好潜质，是通往优化问题通用机器建模的可行路径之一。有鉴于此，本报告将汇报大语言模型辅助的优化通用建模与求解工作，并介绍研究组在这方面的初步探索，相关项目详情请见如下链接。

Github: https://github.com/antgroup/LLMOPT/

Huggingface: https://huggingface.co/ant-opt/LLMOPT-Qwen2.5-14B

Bench4Opt：基于图同构判定的大模型优化建模评测体系

丁添　深圳市大数据研究院

报告摘要：在工业界，数学优化问题的建模往往依赖运筹学专家的领域知识。近年来，大型语言模型（LLM）的发展让自动优化建模成为可能。然而，大模型在优化问题方面的数学建模能力的评估数据较少，并缺少理论可靠的系统性评测方法。为此，我们提出 Bench4Opt，一个用于评估大模型在线性规划（LP）与混合整数线性规划（MILP）建模能力的评测体系。Bench4Opt 包括 818 个模型-数据分离的建模问题，覆盖 16 种问题类型与 40+应用领域。在评测方法上，Bench4Opt 首次提出使用改进的 Weisfeiler-Lehman 图同构检测算法对优化模型的等价性进行判定。实验评估显示，GPT-4o 与 DeepSeek-V3 在自动优化建模方面表现较为优异，分别达到 50.49%与 46.94%的整体准确率，但在不同种类问题上的表现差异显著，揭示了大模型在自动优化建模方面的潜力与现有局限性。

专题报告 C7 随机优化算法

5 月 18 日 15:00 – 16:30　三楼 7 号会议室

On the Complexity of Distributed Nonconvex Optimization

罗珞　复旦大学

报告摘要： We consider the incremental first-order optimization (IFO) for distributed nonconvex optimization. We first revisit the problem setting in single machine scenario by distinguishing the difference between global and mean-squared smoothness parameters. The key observation is that the optimal IFO complexity is indeed achieved by the trade-off between variance reduction methods and classical gradient descent. We then design the distributed algorithm by introducing the new sampling strategy that allows

different mini-batch sizes on different nodes. The theoretical analysis shows the IFO calls, the computational rounds, and the communication rounds of our algorithms are near-optimal. We can extend our results to the problem with PL condition, which also achieve the near-optimal upper complexity bounds.

A Normal Map-Based Proximal Stochastic Gradient Method: Convergence and Identification Properties

邱俊文　新加坡国立大学

报告摘要：The proximal stochastic gradient method (Prox-SGD) is one of the state-of-the-art approaches for stochastic composite-type problems. In contrast to its deterministic counterpart, Prox-SGD has been found to have difficulties with the correct identification of underlying substructures (such as supports, low rank patterns, or active constraints) and it does not possess a finite-time manifold identification property. Existing solutions rely on convexity assumptions or on the additional usage of variance reduction techniques. In this talk, we address these limitations and present a simple variant of Prox-SGD based on Robinson's normal map. The proposed normal map-based proximal stochastic gradient method (Norm-SGD) is shown to converge globally, i.e., accumulation points of the generated iterates correspond to stationary points almost surely. In addition, we establish complexity bounds for Norm-SGD that match the known results for Prox-SGD and we prove that Norm-SGD can almost surely identify active manifolds in finite-time in a general nonconvex setting. Our derivations are built on almost sure iterate convergence guarantees and utilize analysis techniques based on the Kurdyka-Lojasiewicz inequality.

A Momemtum-Based Linearized Augmented Lagrangian Method for Nonconvex Constrained Stochastic Optimization

王晓　中山大学

报告摘要：Nonconvex constrained stochastic optimization has emerged in many important application areas. Subject to general functional constraints it minimizes the sum of an expectation function and a nonsmooth regularizer. Main challenges arise due to the stochasticity in the random integrand and the possibly nonconvex functional constraints. To address these issues we propose a momentum-based linearized

augmented Lagrangian method (MLALM). MLALM adopts a single-loop framework and incorporates a recursive momentum scheme to compute the stochastic gradient, which enables the construction of a stochastic approximation to the augmented Lagrangian function. We provide an analysis of global convergence of MLALM. Under mild conditions and with unbounded penalty parameters, we show that the sequences of average stationarity measure and constraint violations are convergent in expectation. Under a constraint qualification assumption the sequences of average constraint violation and complementary slackness measure converge to zero in expectation. We also explore properties of those related metrics when penalty parameters are bounded. Furthermore, we investigate oracle complexities of MLALM in terms of total number of stochastic gradient evaluations to find an ϵ-stationary point and an ϵ-KKT point when assuming the constraint qualification. Numerical experiments on two types of test problems reveal promising performances of the proposed algorithm.

专题报告 C8 随机一阶算法

5 月 18 日 15:00 – 16:30　三楼 8 号会议室

An Accelerated Distributed Stochastic Gradient Method with Momentum

黄琨　香港中文大学（深圳）

报告摘要：In this talk, we introduce an accelerated distributed stochastic gradient method with momentum for solving the distributed optimization problem, where a group of n agents collaboratively minimize the average of the local objective functions over a connected network. The method, termed "Distributed Stochastic Momentum Tracking (DSMT)", is a single-loop algorithm that utilizes the momentum tracking technique as well as the Loopless Chebyshev Acceleration (LCA) method. We show that DSMT can asymptotically achieve comparable convergence rates as centralized stochastic gradient descent (SGD) method under a general variance condition regarding the stochastic gradients. Moreover, the number of iterations (transient times) required for DSMT to achieve such rates behaves as $O\left(n^{5/3}/(1-\lambda)\right)$ for minimizing general smooth objective functions, and $O\left(\sqrt{n/(1-\lambda)}\right)$ under the Polyak-Lojasiewicz (PL) condition. Here, the term $1-\lambda$ denotes the spectral gap of the mixing matrix related to the underlying network topology. Notably, the obtained results do not rely on multiple inter-node communications or

stochastic gradient accumulation per iteration, and the transient times are the shortest under the setting to the best of our knowledge.

A Modified Subgradient Extragradient Algorithm for Solving Non-Monotone Equilibrium Problems

徐玲玲　南京师范大学

报告摘要：In this paper, a relaxed modified subgradient extragradient algorithm is proposed to solve the equilibrium problems of Lipschitz-type bifunctions without any monotone assumptions in Hilbert spaces. This algorithm uses a non-monotone step to prove the weak convergence of the sequence generated by the algorithm without knowing the Lipschitz-type constant of the bifunctions. Meanwhile, R-linear convergence rate is obtained under the strong pseudomonotonicity of the mapping. Numerical experiments show that compared with other algorithms, the iteration numbers and CPU time of the proposed algorithms are greatly improved when the same termination condition is reached.

Decentralized Conjugate Gradient and Memoryless BFGS Methods

伍浩　南京航空航天大学

报告摘要：This paper proposes a new decentralized conjugate gradient (NDCG) method and a decentralized memoryless BFGS (DMBFGS) method for the nonconvex and strongly convex decentralized optimization problem, respectively. In particular, we show global convergence of NDCG with constant stepsize for general nonconvex smooth decentralized optimization. Our new DMBFGS method uses a scaled memoryless BFGS technique and only requires gradient information to approximate second-order information of the component functions in the objective. We also establish global convergence and linear convergence rate of DMBFGS with constant stepsize for strongly convex smooth decentralized optimization. Our numerical results show that NDCG and DMBFGS are very efficient in terms of both iteration and communication cost compared with other state-of-the-art methods for solving smooth decentralized optimization.

专题报告 C9 组合优化

5 月 18 日 15:00 – 16:30　三楼 9 号会议室

Online Flow Time Minimization: Tight Bounds for Non-Preemptive Algorithms

张宇昊　上海交通大学

报告摘要： This paper studies online scheduling to minimize total flow time for n jobs on m identical machines. Prior work suggests preemption or augmentation is necessary due to an $\Omega(n)$ lower bound for deterministic non-preemptive algorithms on one machine (Kellerer et al., SICOMP 1999). But what about $m > 1$? Can randomness help?We answer both. We give a deterministic algorithm with ratio $O(n/m^2 + \sqrt{n/m}\log m)$ and a nearly matching lower bound. We also give a tight randomized algorithm with ratio $O(\sqrt{n/m})$, breaking the $\Omega(n)$ deterministic lower bound when $m = 1$.We also study the kill-and-restart model. For $m = 1$, we prove an $\Omega(n/\log n)$ bound. For $m \geq 2$, we present a tight $O(\sqrt{n/m})$ deterministic algorithm. Our algorithms are polynomial-time and improve the best-known offline approximation ratio from $O(\sqrt{n/m}\log(n/m))$ to $O(\sqrt{n/m})$.

Polylogarithmic Approximations for Robust s-t Path

许晨阳　华东师范大学

报告摘要： The work revisits robust s-t path. In the problem, we are given a directed graph with n vertices and k distinct cost functions (scenarios) defined over edges, and aim to choose an s-t path such that the total cost of the path is always provable no matter which scenario is realized. Viewing each cost function as an agent, our goal is to find a fair s-t path, which minimizes the maximum cost among all agents. Our main result is a $O(\log n \log k)$ approximation for the Robust s-t Path problem in quasi-polynomial time, solving the open question in the quasi-polynomial time regime. The algorithm is built on a novel linear program formulation for a decision - tree- type structure, which enables us to overcome the $\Omega(\sqrt{n})$ integrality gap for the natural flow LP. Furthermore, we show that for graphs with bounded treewidth, the quasi-polynomial running time can be improved to a polynomial.

Mixed Graph Covering with Target Constraints

王长军　　中国科学院数学与系统科学研究院

报告摘要：The target-constrained mixed graph covering (TMGC) problem considers a graph where edges and vertices are each assigned a cost and a weight. The goal is to select a minimum-cost subset of vertices and edges subject to the covering-target constraint that its covered weight meets or exceeds a given threshold. From a theoretical perspective, this TMGC model extends the weighted partial vertex cover problem in two significant ways: it incorporates covering weights for both edges and vertices, and it allows a direct selection of edges alongside vertices to satisfy the covering target. Despite this increased complexity and generality compared to (the partial version of) the classic vertex cover problem, we develop a 2-approximation primal-dual algorithm for TMGC, whose ratio 2 matches the known lower bound for the simpler vertex cover problem.

专题报告 C10 学习优化

5 月 18 日 15:00 – 16:30　二楼悦贵 3 厅

ROS: A GNN-based Relax-Optimize-and-Sample Framework for Max-*k*-Cut Problems

邱烨卿　　香港中文大学（深圳）

报告摘要：The Max-k-Cut problem is a fundamental combinatorial optimization challenge that generalizes the classic NP-complete Max-Cut problem. We introduce the Relax-Optimize-and-Sample (ROS) framework in this work. In particular, we begin by relaxing the discrete constraints to the continuous probability simplex form. Next, we pre-train and fine-tune a graph neural network model to efficiently optimize the relaxed problem. Subsequently, we propose a sampling-based construction algorithm to map the continuous solution back to a high-quality Max-k-Cut solution. By integrating geometric landscape analysis with statistical theory, we establish the consistency of function values between the continuous solution and its mapped counterpart. Extensive experimental results on random regular graphs and the Gset benchmark demonstrate that the

proposed ROS framework effectively scales to large instances with up to 20,000 nodes in just a few seconds, outperforming state-of-the-art algorithms.

当图神经网络遇上整数线性规划中的对称性：一种基于 orbit 的特征增强方法

陈乾　香港中文大学（深圳）

报告摘要：整数线性规划（ILP）作为运筹优化领域的核心问题，广泛应用于资源调度、生产制造等实际场景，其目标是在满足线性约束的整数变量中寻找最优解。同时，许多 ILP 问题具有显著的对称性特征，即变量置换后问题结构与解集保持不变。近年来，图神经网络（GNN）因其对图结构的强大建模能力被引入 ILP 求解领域，通过将问题建模为变量-约束二分图，GNN 能够学习变量间关系并为传统算法提供预测支持，进而加速求解。然而，我们发现，GNN 的置换等变性、置换不变性与 ILP 的对称性相互作用，会导致模型无法区分对称变量，这一“不可区分问题”严重降低了预测性能，成为制约 GNN 应用于对称 ILP 的重要瓶颈。

现有方法在处理对称性挑战时存在明显局限。经典优化方法依赖人工设计的对称破缺约束或轨道（Orbit）分支策略，虽能减少冗余搜索但缺乏灵活性和扩展性。机器学习领域虽尝试通过添加随机特征或位置编码增强变量区分度，但这些方法缺乏系统性理论指导，可能因特征设计不当引发训练冲突。例如，随机特征可能在不同对称组中引入矛盾样本，干扰模型学习。

为解决上述问题，我们从理论层面揭示了 GNN 在对称 ILP 中失效的根源。我们发现，GNN 的置换等变性要求模型对输入置换具有输出等变性，而 ILP 的对称性要求可行解在变量置换下保持不变，这两种性质相互作用导致 GNN 无法区分对称的变量。为突破这一瓶颈，我们提出基于特征增强的对称性破缺框架，并确立三大设计原则：首先，增强特征需使对称变量可分（可区分性）；其次，避免引入过多噪声干扰训练（增强简约性）；最后，保持问题同构等价性以维护结构信息（同构一致性）。基于这些原则，我们设计了一种 Orbit 驱动的特征增强方案，利用群论中的 Orbit 概念将对称变量分组，并为每组独立采样离散型增强特征，确保组内特征差异显著，从而解决“不可区分性问题”问题，提高模型预测精度。

实验验证表明，该方案在装箱、资源分配等典型对称 ILP 问题上表现优异。与基线方法相比，Orbit 增强使 GNN 预测性能显著提升，并减少训练迭代次数。理论分析发现，增强特征有效分离了对称变量在嵌入空间中的表示，保证了“可区分性”原则。同时，离散均匀采样策略避免了传统随机特征过大的采样空间，证实了“增强简约性”原则的实践价值。此外，训练样本中同构特性的维护提高了模型的训练质量，验证了“同构一致性”原则的有效性。

LMask: Learn to Solve Constrained Routing Problems with Lazy Masking

李天佑　北京大学

报告摘要：Routing problems are canonical combinatorial optimization tasks with wide-ranging applications in logistics and transportation. However, efficiently generating high-quality feasible solutions for routing problems with complex constraints remains a challenging goal in practice. In this talk, we introduce LMask, a novel unsupervised learning framework that utilizes a dynamic masking mechanism to solve constrained routing problems effectively. The decoding method of LMask lazily refines feasibility masks to guide the auto-regressive decoder with backtracking. By incorporating mask embedding into the transformer-based model architecture, LMask enhances constraint awareness and generalization across routing problems. To reduce computational costs during training, we limit the number of backtracking steps and penalize the violations in the loss function. Extensive experiments show that LMask achieves state-of-the-art feasibility rates and solution quality compared to existing neural methods.

专题报告 C11 次模优化

5 月 18 日 15:00 – 16:30　三楼 11 号会议室

Efficient Deterministic Algorithms for Maximizing Symmetric Submodular Functions

张智杰　福州大学

报告摘要：Symmetric submodular maximization is an important class of combinatorial optimization problems, including MAX-CUT on graphs and hyper-graphs. The state-of-the-art algorithm for the problem over general constraints has an approximation ratio of 0.432 [Feldman, TALG17]. However, the algorithm suffers from high query complexity and is inherently randomized since it applies the canonical continuous greedy technique that involves a sampling process. To circumvent this, we present several efficient deterministic algorithms for maximizing a symmetric submodular function under various constraints,

including cardinality, matroid, and knapsack constraints. All of our algorithms require fewer queries than the current best deterministic algorithms while achieving comparable or even superior approximation ratios.

Non-monotone DR-submodular Maximization with Down-closed Convex Constraints

陈晟敏杰　中国科学院计算技术研究所

报告摘要：In this talk, we investigate the non-monotone DR-submodular maximization problem subject to a down-closed convex solvable constraint. First, we construct a counterexample to demonstrate that (first-order) stationary points can have arbitrarily bad approximation ratios, and they are usually on the boundary of the feasible domain. Moreover, this example offers insights on how to design improved algorithms by avoiding bad stationary points, such as the restricted continuous local search algorithm and the aided measured continuous greedy. However, the analyses in the last two algorithms need to invoke the inequality that the multilinear extension of any submodular set function is bounded from below by its Lovasz extension. Our second contribution, therefore, is to remove this restriction and show that both algorithms can be extended to the continuous domain while retaining the same approximation ratios, and hence offering improved approximation ratios over those in for the same problem.

单面光滑+凹函数最大化问题的近似算法设计

张洪祥　中国科学院大学

报告摘要：单面光滑+凹函数的优化模型在众多领域有着广泛的应用，如在图像恢复与重建问题中，需要最大化凹函数来衡量图像质量，同时在图像采集过程中会受到二次单面光滑函数噪声的影响。2021 年，Mehrdad 等人为了解决更广义集合函数的多线性扩展函数最大化问题，扩展了连续 DR 次模函数的应用，提出了单面光滑函数的概念。连续 DR 次模函数和凹函数在非负方向上都具有梯度递减的性质。梯度递减特性在连续非凸二次函数最大化问题的近似算法设计和理论分析中起着重要的作用。当次模函数扩展到单面光滑函数时，该性质不存在。

专题报告 C12 随机优化

5 月 18 日 15:00 – 16:30　二楼悦贵 1 厅

Bayesian Nash Equilibrium in Price Competition under Multinomial Logit Demand

孙海琳　南京师范大学

报告摘要：纳什均衡（NE）一直是理解市场中离散选择需求价格竞争的重要方法。现有的 NE 模型假设产品的边际成本是公开的。然而这一假设可能不成立。本文提出了一种贝叶斯-纳什均衡（BNE）模型，用于分析 MNL 需求下的市场竞争，其中公司的边际成本是私人信息。与现有纳什均衡模型不同，BNE 是一个依赖于边际成本的价格函数元组，在均衡状态下，没有公司能通过单方面改变价格函数获得更好的结果。我们推导了连续 BNE 存在性和唯一性的充分条件，设计了 BNE 的离散化方法，并将离散后的 BNE 问题转换为有限维随机变分不等式，并利用 PHA 算法并行求解。

Distributed Optimization with Imperfect Model Parameters

雷金龙　同济大学

报告摘要：分布式优化已被广泛应用于经济调度、智能电网和机器学习等各类合作决策问题的建模与求解。然而，在许多复杂场景中，智能体需在不确定性条件下进行决策。本次报告聚焦于智能体成本函数中含不确定参数的两类分布式优化问题：其一是分布式随机优化问题，其中未知参数可通过独立的分布式参数学习问题求解；其二是分布式自适应优化问题，所有智能体仅能访问包含公共未知参数的局部成本函数，但需通过连通通信图协作估计真实参数并寻求最优解。针对这两类问题，我们分别提出了能同步估计未知参数并更新决策变量的分布式优化方法，并相应分析了其收敛性和收敛速度。

Bi-Attribute Utility Preference Robust Optimization: A Continuous Piecewise Linear Approximation Approach

吴琼　南京师范大学

报告摘要： In this talk, we consider a bi-attribute decision making problem where the decision maker's (DM's) objective is to maximize the expected utility of outcomes with two attributes but where the true utility

function which captures the DM's risk preference is ambiguous. To tackle this ambiguity, we propose a maximin bi-attribute utility preference robust optimization (BUPRO) model where the optimal decision is based on the worst-case utility function in an ambiguity set of plausible utility functions constructed by a linear system of inequalities represented by the Lebesgue–Stieltjes integrals. We propose a continuous piecewise linear approximation approach to approximate the DM's unknown true utility to solve the problem. To quantify the approximation errors, we derive, under some mild conditions, the error bound for the difference between the BUPRO model and the approximate BUPRO model in terms of the ambiguity set, the optimal value and the optimal solutions.

专题报告 C13 机器学习优化算法与理论

5 月 18 日 15:00 – 16:30　二楼悦贵 2 厅

An Augemented Largangian Primal-Dual Semismooth Newtown for Multi-Block Composite Optimization

邓展望　　北京大学

报告摘要： In this paper, we develop a novel primal-dual semismooth Newton method for solving linearly constrained multi-block convex composite optimization problems. First, a differentiable augmented Lagrangian (AL) function is constructed by utilizing the Moreau envelopes of the nonsmooth functions. It enables us to derive an equivalent saddle point problem and establish the strong AL duality under the Slater's condition. Consequently, a semismooth system of nonlinear equations is formulated to characterize the optimality of the original problem instead of the inclusion-form KKT conditions. We then develop a semismooth Newton method, called ALPDSN, which uses purely second-order steps and a nonmonotone line search based globalization strategy. Through a connection to the inexact first-order steps when the regularization parameter is sufficiently large, the global convergence of ALPDSN is established. Under the regularity conditions, partial smoothness, the local error bound, and the strict complementarity, we show that both the primal and the dual iteration sequences possess a superlinear convergence rate and provide concrete examples where these regularity conditions are met. Numerical results on the image restoration with two regularization terms and the corrected tensor nuclear norm problem are presented to demonstrate the high efficiency and robustness of our ALPDSN.

An Augmented Lagrangian Value Function Method for Lower-level Constrained Stochastic Bilevel Optimization

聂涵韬　北京大学

报告摘要： Recently, lower-level constrained bilevel optimization has attracted increasing attention. However, existing methods mostly focus on either deterministic cases or problems with linear constraints. The main challenge of stochastic cases with general constraints is the bias and variance of the hyper-gradient, arising from the inexact solution of lower-level problem.

In this paper, we propose a novel stochastic augmented Lagrangian value function method for solving stochastic bilevel optimization problems with nonlinear lower-level constraints. Our approach reformulates the original bilevel problem using an augmented Lagrangian-based value function and then applies a penalized stochastic gradient method that carefully manages the noise from stochastic oracles. We establish an equivalence between the stochastic single-level reformulation and the original constrained bilevel problem and provide a non-asymptotic rate of convergence for the proposed method. The rate is further enhanced by employing variance reduction techniques. Extensive experiments on synthetic problems and real-world applications demonstrate the effectiveness of our approach.

ODE-Based Learning to Optimize

谢中林　北京大学

报告摘要： 近年来，通过常微分方程（ODE）研究加速方法的理论视角备受关注，但将连续时间模型中的快速收敛特性转移到迭代算法仍面临挑战。本文提出融合惯性系统与 Hessian 驱动阻尼方程（ISHD）及学习方法的优化框架，建立了 ISHD 解轨迹收敛的理论条件，并证明在稳定性条件下，其显式欧拉离散生成的序列具有收敛性，由此导出一族优化方法。为针对特定问题的调优，本文引入"停止时间"概念，并构建了以最小化停止时间为目标、满足收敛与稳定性约束的学习优化（L2O）模型。数值实验表明，该框架生成的优化方法在多种问题中均表现优异。

专题报告 C14 非光滑优化问题的高效算法

5 月 18 日 15:00 – 16:30　二楼悦华 1 厅

A Fast BB Reduced Minimization Algorithm for Nonnegative Viscosity Optimization in Optimal Damping

李庆娜　北京理工大学

报告摘要：We consider the fast optimization algorithm for optimal viscosities in damping system. Different from standard models that minimize the trace of the solution of parameterized Lyapunov equation, the nonnegative constraints for viscosities are added in the optimization model, which hasn't been considered before.

To solve the new model, a gradient-based algorithm is then proposed, aiming at reducing the residuals of the corresponding KKT conditions. By combining with the Barzilai-Borwein stepsize, the proposed BB residual minimization algorithm (short for BBRMA) can further speed up to deal with large scale linear vibration systems. Extensive numerical results verify the high efficiency of the proposed algorithm.

A Single-Loop Proximal-Conditional-Gradient Penalty Method

曾燎原　浙江工业大学

报告摘要：本次报告将介绍一种单循环邻近条件梯度罚方法，用于最小化含线性耦合约束的凸可分目标函数。该目标函数可表示为两个适当的闭凸函数 f 与 g 的和。在每次迭代中，我们对二次罚函数分别执行一步关于函数 f 的邻近梯度步和一步关于函数 g 的广义条件梯度步，随后使用显式的规则更新罚参数及下一步条件梯度步的步长。在标准的约束规范条件下，我们将展示所生成序列的目标函数值与最优值的偏差以及约束违反度的衰减速率。此外，对于一类满足 Kurdyka-Lojasiewicz 性质的问题，我们还将展示序列到最优解集距离的衰减速率。

An Improved Proximal DCA with Extrapolation and Barzilai-Borwein Step Size

陈永鑫　北京航空航天大学

报告摘要： In this talk, we propose an improved proximal difference of convex algorithm (DCA) with extrapolation and Barzilai-Borwein step size for solving the difference of convex (DC) programming problem. We reveal a relationship between the relaxation of proximal parameters and extrapolation parameters. Moreover, we discuss parameter selections and propose a practical algorithm with a nonmonotone line search. This search method is an efficient acceleration technique and more flexible than monotone line search. Additionally, we design a new potential function for convergence analysis, enhancing the practicality of our proposed algorithms. The convergence and convergence rate of the iterative sequence can be obtained under the assumption of the Kurdyka - Lojasiewicz property. Numerical experiments demonstrate the effectiveness and practicability of the proposed algorithms.

专题报告 C15 变分与半变分不等式的理论、方法与应用

5 月 18 日 15:00 – 16:30　二楼悦华 2 厅

Non-Autonomous Evolution Inclusions with State-Dependent Sweeping Processes: A Study on Well-Posedness and Approximate Controllability

杜今生　广西大学

报告摘要： This paper explores the approximate controllability of a specific class of systems that combine non-autonomous evolution inclusions with state-dependent sweeping processes, within the context of Hilbert spaces. The analysis begins by establishing the well-posedness of the coupled system, which is derived through the application of the multivalued version of Schauder's fixed-point theorem, alongside various techniques from non-convex analysis. The resolvent operator method is then employed to demonstrate the approximate controllability of the coupled system. Finally, a real-world example is provided, showcasing a thermally coupled frictionless contact problem that incorporates an external heat source, thus emphasizing the practical implications of the theoretical findings.

Unique Existence of Solution and Hyers-Ulam Stability for a New Fractional Differential Quasi-Variational Inequality with Mittag-Leffler Kernel and its Applications

吴增宝　洛阳师范学院

报告摘要：This talk considers a new fractional differential quasi-variational inequality with Mittag-Leffler kernel comprising a fractional differential equation with Mittag-Leffler kernel and a quasi-variational inequality in Hilbert spaces. Some properties of the solution for the parameterized quasi-variational inequality are investigated, which improve the known results. Moreover, the unique existence of the solution and Hyers-Ulam stability are obtained for such a novel system under mild conditions. Finally, the obtained abstract results are applied to analyze the unique solvability and stability for a multi-agent optimization problem and a price control problem.

A New Nonlocal Impulsive Fractional Differential Hemivariational Inclusions with an Application to a Frictional Contact Problem

陈涛　西南石油大学

报告摘要：In this talk, we shall present a novel impulsive fractional differential hemivariational inclusions (IFDHI) with a nonlocal condition, comprising an impulsive fractional differential inclusion (IFDI) with a nonlocal condition and a hemivariational inequality (HVI), within separable reflexive Banach spaces. Additionally, we employ our principal findings to establish the solvability of a new frictional contact problem (FCP) concerning an elastic body interacting with a foundation within a finite time interval, considering the temperature effect.

专题报告 D1 随机优化

5 月 18 日 16:45 – 18:15　二楼悦贵 1 厅

Dynamic Stochastic Approximation Jacobi-Type ADMM Method for Two-stage Stochastic Generalized Nash Equilibrium Problems

周斌　南京邮电大学

报告摘要：本文研究了一类双阶段随机广义纳什均衡问题（SGNEPs），其中每个参与者在随机环境中进行双阶段序贯决策：他们在当前（第一阶段）做出决策并与彼此竞争，随后在将来（第二阶段）做出决策。这种双阶段 SGNEPs 在生产制造，运输物流和投资组合管理等领域广泛存在。从求解问题的角度来看，双阶段 SGNEPs 与单阶段 SGNEPs 的主要区别在于需要处理第二阶段问题的最优值函数，而该函数没有明确表达式。为克服这一困难，本文提出了一种加速原始对偶方法（APDM）来获得第二阶段最优值函数的 ϵ－次梯度，实现了 $\mathcal{O}\left(\frac{1}{\sqrt{N}}\right)$ 的收敛速率。利用此 ϵ－次梯度及方差简化技术，提出并应用了一种动态随机近似雅可比交替方向乘子法（DSA-JADMM）来求解双阶段 SGNEPs。该算法是雅可比 ADMM 的一种不精确随机版本，因在每次迭代中使用 APDM 随机计算第二阶段的 ϵ－次梯度。还表明该算法可收敛至双阶段 SGNEPs 的弱 ϵ－变分均衡点，收玫速率为 $\mathcal{O}\left(\frac{1}{\sqrt{K}}\right)$ 。为验证 DSA－JADMM 的有效性，本文开展了初步数值实验。

Robust Solutions to a System of Stochastic Vertical Linear Complementarity Problems

查啸　香港理工大学

报告摘要：We propose a stochastic minimization model to find a robust solution of a system of stochastic vertical linear complementarity problems. This model is to minimize a risk function under stochastic vertical linear complementarity constraints. We reformulate the model with a finite support set as a linearly constrained piecewise smooth minimization problem by a penalty method. We prove the existence of exact penalty parameters regarding global and local minimizers. We define a smoothing function of the piecewise smooth objective function and show the smoothing function satisfies the Kurdyka-Lojasiewicz (KL) property. Moreover, we propose a smoothing block coordinate descent algorithm, and prove that the sequence

generated by the algorithm globally converges to an ϵ-Clarke stationary point of the penalty problem by the KL property for any $\epsilon>0$. Finally, we apply our model and algorithm to portfolio selection problems with real data. Numerical results demonstrate the robustness of our model.

A Bayesian Approach to Data-Driven Distributionally Robust Variational Inequality Problem: Formulations, Asymptotics and Quantification

马文韬　香港理工大学

报告摘要： This paper proposes a Bayesian distributionally robust variational inequality (DRVI) framework, integrating Bayesian inference with DRVI. Our model features three key contributions: (1) approximating distributional ambiguity via a parametric family with Bayesian posterior guarantees; (2) constructing data-adaptive ambiguity sets that dynamically quantify uncertainty with prior belief and observations; and (3) introducing a regularization term for numerical stability.

We prove the existence of solutions and demonstrate asymptotic convergence to the true solution as regularization diminishes and sample size increases. Additionally, we establish finite-sample guarantees and conduct stability analyses to illustrate robustness against limited samples and data contamination. Numerical experiments on a generalized Nash equilibrium problem validate our theoretical results and show superior performance over existing models.

分组自由报告 1 连续优化

5 月 18 日 16:45 – 18:15　三楼 1 号会议室

Inertial Primal-Dual Dynamics with Hessian-Driven Damping and Tikhonov Regularization for Convex-Concave Bilinear Saddle Point Problems

何亮　重庆工商大学

报告摘要：This paper deals with a second-order primal-dual dynamical system with Hessian-driven damping and Tikhonov regularization terms in connection with a convex-concave bilinear saddle point problem. We

first obtain a fast convergence rate of the primal-dual gap along the trajectory generated by the dynamical system, and provide some integral estimates. Then, based on the setting of the parameters involved, we demonstrate that both the convergence rate of the primal-dual gap and the strong convergence of the trajectory can be achieved simultaneously. Furthermore, we evaluate the performance of the proposed system by numerical examples.

An Efficient Outcome-Space Branch-and-Bound Algorithm for Solving a Class of Large-Scale Linear Multiplicative Programs

井霞　北方民族大学

报告摘要： In this paper, we present an efficient algorithm for solving a class of large-scale linear multiplicative programs (LMPs). The problem LMP is first converted into an equivalent problem (ENP) and then a λ-piecewise linear relaxation technique is proposed. This technique establishes a linear relaxation problem, providing a valid lower bound for the global optimal value of the ENP. This leads to the proposal of a novel outcome space-based branch-and-bound algorithm for a class of LMPs. Meanwhile, a new region reduction technique is implemented in the outcome space to eliminate as many infeasible regions as possible. In addition, the paper provides a convergence analysis, a complexity assessment of the algorithm, and estimates the number of worst-case iterations required to attain an-ϵ-optimal solution. Finally, the new algorithm is compared to state-of-the-art alternatives, demonstrating its advantages in solving large-scale LMPs.

Output-Space Branch-and-Bound Reduction Algorithm for Solving Generalized Linear Multiplicative Programming Programs

马素霞　宁夏大学

报告摘要： We consider a class of generalized linear multiplicative problems (GLMP). In this paper, we first transform it into an equivalent problem (EP) by introducing p new variables and applying logarithmic transformation. Secondly, in order to calculate the lower bound, we derived the linear relaxation problem (LRP) of EP by constructing a novel relaxation strategy. Additionally, a rectangular region reduction

technique is proposed to accelerate the convergence speed of the algorithm. Based on the output-space search, we propose a new branch-and-bound algorithm for tackling the GLMP or EP. The global convergence of the algorithm is proved, and its computational complexity is analyzed to estimate the maximum number of iterations. Especially on the basis of LRP, we also propose another new convex relaxation based branch-and-bound algorithm for GLMP. Some experimental examples demonstrate the feasibility and effectiveness of these two algorithms.

A Relaxation Method for Binary Orthogonal Optimization Problems with its Applications

肖亮海　暨南大学

报告摘要：This study focuses on a class of binary orthogonal optimization problems frequently arising in semantic hashing. We introduce an equivalent model involving a restricted Stiefel manifold and a matrix box set, and then investigate its penalty problems induced by the l_1-distance from the box set and its Moreau envelope. The penalty problem induced by the Moreau envelope is a smooth optimization over an embedded submanifold with a favorable structure. We develop a retraction-based line-search Riemannian gradient method to address the penalty problem. Finally, the proposed method is applied to supervised and unsupervised hashing tasks and is compared with several popular methods on real-world datasets. The numerical comparisons reveal that our algorithm is significantly superior to other solvers in terms of feasibility violation, and it is comparable even superior to others in terms of evaluation metrics related to the Hamming distance.

An Efficient Unsupervised Framework for Convex Quadratic Programs via Deep Unrolling

杨林鑫　香港中文大学（深圳）

报告摘要：二次规划（QP）广泛应用于机器学习、金融和控制等多个领域。近年来，增强学习的原始-对偶混合梯度（PDHG）方法在求解大规模线性规划中展现出巨大潜力，但该方法尚未扩展到二次规划。在本研究中，我们聚焦于展开“PDQP”算法——这是一种专门针对凸二次规划的 PDHG 算法。具

体而言，我们提出了一种名为“PDQP-net”的神经网络模型，用于学习最优的 QP 解。从理论上讲，我们证明了一个多项式规模的 PDQP-net 可以与 PDQP 算法保持一致，从而输出最优的原始-对偶解对。我们还提出了一种无监督方法，将 KKT 条件融入损失函数。与传统的“学习优化”框架不同，我们的方法无需借助优化器生成的解，而是通过直接评估原始-对偶间隙来调整网络权重。这一方法相较于监督学习具有两大优势：首先，由于将原始-对偶间隙纳入目标函数，能够帮助生成更优的间隙；其次，它不依赖于求解器。我们展示了在这种无监督方式下训练的 PDQP-net 能够有效逼近最优的 QP 解。大量数值实验验证了我们的发现：使用 PDQP-net 预测结果对 PDQP 进行热启动，在标准 QP 实例上可实现最多 45%的加速；在分布外的实例上也能实现 14%到 31%的加速。

分组自由报告 2 连续优化

5 月 18 日 16:45 – 18:15　三楼 2 号会议室

基于最优控制的舰载机自动着舰控制研究

李昕　　大连理工大学

报告摘要：由于舰载机在航母甲板上降落风险高、易发生事故，我们提出了一种基于自适应动态规划的自动着舰控制求解框架，辅助飞行员实现安全且高效的着舰过程。首先，为了时刻给舰载机提供理想着舰点位置的参考依据，设计了基于回声状态网络的运动预测模块，预测海洋环境下的甲板运动。其次，以舰载机的扩展纵向线性小扰动模型为状态方程，以扰动输入的变化率为控制输入，以最小化跟踪误差为性能指标函数，建立纵向着舰最优控制模型。最后，通过自适应动态规划对该问题进行求解，能够根据舰载机状态实时产生最优控制输入，实现不同海况下舰载机的平稳着舰控制。仿真算例表明，在低、中、中高和高海况下所提方法均能够控制舰载机自动降落在理想着舰点附近。

Convergence Rate of Inexact Augmented Lagrangian Method with Practical Relative Error Criterion for Composite Convex Programming

屈云飞　　北京航空航天大学

报告摘要：In this paper, we consider the composite convex optimization problem with a linear equality constraint. We propose a practical inexact augmented Lagrangian (IAL) framework that employs two relative

error criteria. Under the first criterion, we demonstrate convergence and establish sublinear ergodic convergence rates. By incorporating the second criterion, we achieve sublinear non-ergodic convergence rates. Furthermore, we determine the total iteration complexity of the IAL framework by slightly relaxing these criteria. Numerical experiments on both synthetic and real-world problems are conducted to illustrate the efficiency of the proposed IAL method.

Graphical Derivative Characterizations of Relative Stability with Applications to Affine Variational Inequalities

史子剑　广西大学

报告摘要：We investigate relative stability analysis, a useful and necessary extension of traditional stability analysis. We obtain characterizations of relative stability and relative strong stability and apply them to solution mappings of generalized equations and affine variational inequalities.

Risk-Averse Optimal Control Model Under Uncertainty and Its Modified Progressive Hedging Algorithm

吴迪　上海工程技术大学

报告摘要：It is of practical importance to incorporate a risk-averse objective in an optimal control problem under uncertainty. By leveraging the dual relationship between risk and regret measures, the risk-averse optimal control problem can be equivalently transformed into an optimal control problem with nonanticipativity constraints and expectation objective function. A modified progressive hedging algorithm is then proposed to solve the transformed problem, in which the descent conditions are enforced to ensure global convergence of the algorithm. Numerical results of three different types of problems are presented to show the applicability and effectiveness of the modified progressive hedging algorithm.

分组自由报告 3 连续优化

5 月 18 日 16:45 – 18:15　三楼 3 号会议室

Smoothed Hybrid lp-l2 Model for Sparse Optimization

高雪瑞　上海工程技术大学

报告摘要：We introduce a novel regularization term combining a smoothed sub-one lp quasi-norm and l2 norm, eliminating the non-differentiability issue of the sub-one lp quasi-norm. This term facilitates the transformation of the model into two convex sub-models, enabling approximation of the global optimal solution. The coefficients of the hybrid term are data-driven. Applied to sparse optimization, the problem is divided into two sub-problems. We develop the P2ISTA algorithm to address the smoothed hybrid lp-l2 regularization model and analyze its convergence. Comparative studies with existing methods (Soft, Half, PQA, PLAFPAp) on image deblurring tasks show that P2ISTA excels in sparse solution accuracy and computational efficiency.

Solving Quadratic Programs via Deep Unrolled Douglas-Rachford Splitting

熊锦欣　香港中文大学（深圳）

报告摘要：Convex quadratic programs (QPs) are fundamental to numerous applications, including finance, engineering, and energy systems. Among the various methods for solving them, the Douglas-Rachford (DR) splitting algorithm is notable for its robust convergence properties. Concurrently, the emerging field of Learning-to-Optimize offers promising avenues for enhancing algorithmic performance, with algorithm unrolling receiving considerable attention due to its computational efficiency and interpretability. In this work, we propose an approach that unrolls a modified DR splitting algorithm to efficiently learn solutions for convex QPs. Specifically, we introduce a tailored DR splitting algorithm that replaces the computationally expensive linear system-solving step with a simplified gradient-based update, while retaining convergence guarantees. Consequently, we unroll the resulting DR splitting method and present a well-crafted neural network architecture to predict QP solutions.

Convergence Rate Analysis of a Dykstra-Type Projection Algorithm

王晓宙　华南师范大学

报告摘要：设$C:=\bigcap_{i=1}^{l}A_i^{-1}C_i$，其中$C_i$是闭凸集，$\mathrm{A}_i$是非零线性映射，$i=1$，…，$l$。我们研究最佳近似问题， 即计算定点到集合 C 的投影。在适当条件下， 当每个C_i是$C^{1,\alpha}$-锥可约时，我们证明了问题的对偶目标函数在对偶最优解集的某个邻域上满足 Kurdyka-Łojasiewicz（KL）性质，并且 KL 指数可以计算。$C^{1,\alpha}$-锥可约闭凸集包括了C^2-锥可约闭凸集，后者包括了所有多面体、二阶锥和正半定矩阵锥等。利用误差界性质，我们建立了 Dykstra 算法求解该问题的线性或者次线性收敛速度。

A Step Function based Recursion Method for 0/1 Deep Neural Networks

张辉　曲阜师范大学

报告摘要：采用阶跃函数激活的深度神经网络是深度学习领域中一个经典本原模型，其具备高效计算特性及对异常值的强鲁棒性。本研究通过向 0/1 深度神经网络中引入两套网络节点变量，并深入探究所得模型的复合结构特征，递归式地将 0/1 深度神经网络分解为：一个与阶跃函数相关的一元优化模型，以及三个与其他变量相关的派生优化子问题。针对一元优化模型及两个派生优化子问题，我们给出了闭式解析解；而对于第三个派生优化子问题，则提出了一种高效的近端求解方法。基于上述理论，我们开发了一种基于阶跃函数的递归求解算法用于 0/1 深度神经网络，并分析了算法的全局收敛性。通过理论分析，以及在 MNIST、FashionMNIST 和 Cifar10 标准数据集上的分类对比实验，验证了所提算法的高效性和优越性能。

Adaptive Lq Regularized Estimation for High-dimensional Sparse Covariance Matrix

赵弘欣　中国科学院数学与系统科学研究院

报告摘要：高维协方差矩阵估计在经济学、生物学、社会科学与健康科学等诸多应用领域具有重要作用。为提高估计精度，当前主流的结构性假设是协方差矩阵具有稀疏性或近似稀疏性。本文提出一种

带最小特征值约束的自适应 Lq ($0 < q < 1$) 正则化估计方法，用于高维稀疏协方差矩阵估计，该方法避免了传统两阶段估计框架（即先估计相关系数矩阵再估计协方差矩阵）的局限性。所提方法对协方差矩阵的异方差性具有较强适应能力。在适当正则性条件下，我们分析了该估计量的渐近性质与有限样本表现。提出的迭代重加权最小化方法及其不精确变体可实现有效估计。仿真实验表明，该估计方法优于多种现有先进方法。

分组自由报告 4 连续优化

5 月 18 日 16:45 – 18:15　三楼上海厅

Eligible 正则化模型、加速算法及其应用研究

李倩　上海工程技术大学

报告摘要：在当前机器学习、深度学习及统计学习的前沿研究中，众多核心科学难题能够借助一类基于正则项的稀疏优化模型进行有效表征。本次报告的内容致力于深入探索这类基于正则项的稀疏优化模型、有效算法及实际应用场景，以期推动该领域发展。为此，首先系统回顾已有正则项的理论特性，并创新地提出 Eligible 正则项的概念。其次，建立了基于可分和不可分 Eligible 正则项的精确恢复理论。接着，构建了 Eligible 正则稀疏优化模型，并设计了求解该模型的高效邻近梯度算法和加速邻近梯度算法框架。最后，通过相位图分析和稀疏指数追踪的实证分析结果显示，相比传统稀疏模型，Eligible 正则稀疏优化模型在保持高度稀疏性的同时，显著提高了预测精度和模型稳定性。

Sharp-Peak Functions for Exactly Penalizing Binary Integer Programming

李帅　北京交通大学

报告摘要：Unconstrained binary integer programming (UBIP) is a challenging optimization problem due to the presence of binary variables. To address the challenge, we introduce a new class of functions, sharp-peak functions (SPFs), which equivalently reformulate the binary constraints as equality constraints, giving rise to SPF-constrained optimization. Instead of solving this optimization, we aim to tackle its penalty model. The established exact penalty theory shows that the global minimizers of UBIP and the penalty model coincide

when the penalty parameter exceeds a threshold, a constant independent of the solution sets of UBIP. Moreover, we introduce the Karush-Kuhn-Tucker points and P-stationary points of the penalty model and explore their relationships with local and global minimizers. Most importantly, the P-stationary points enable us to develop an algorithm called ShaPeak to solve the penalty problem, where the penalty and stationary parameters are updated adaptively to enhance numerical performance. Furthermore, ShaPeak is proven to converge to a P-stationary point within a finite number of steps under a single mild assumption, namely, the strong smoothness on a unit box of the objective function. Finally, numerical experiments demonstrate the advantages of using SPF's and the high performance of ShaPeak in comparison to established solvers.

Near-Optimal Algorithms for Convex Simple Bilevel Optimization under Weak Assumptions

石旭　复旦大学

报告摘要： This paper considers the simple bilevel optimization problem, which involves minimizing a composite convex function over the optimal solution set of another composite convex minimization problem. By reformulating this bilevel problem as finding the left-most root of a nonlinear equation and introducing a novel dual approach for the subproblems, we efficiently obtain an (ϵ, ϵ)-optimal solution. The proposed methods achieve near-optimal complexity of $\widetilde{\boldsymbol{cO}}(\mathbf{1}/\sqrt{\epsilon})$ for both the upper- and lower-level objectives under mild assumptions, aligning with the optimal complexity bounds of first-order methods in unconstrained smooth or composite convex optimization when ignoring logarithmic terms.

A Projected Semismooth Newton Method for Prox-regular Sparse Optimization Problems

吴育洽　深圳大学

报告摘要： We are concerned with a class of nonconvex nonsmooth composite optimization problems, comprising a twice differentiable function and a prox-regular function that induces sparsity. We establish a sufficient condition for the proximal mapping of a prox-regular function to be single-valued and locally Lipschitz continuous. By virtue of this property, we propose a hybrid method of proximal gradient and

projected semismooth Newton methods for solving these composite problems, which is a globalize semismooth Newton method. The whole sequence is shown to converge to an L-stationary point under a Kurdyka-$\{L\}$ojasiewicz exponent assumption. Under an additional error bound condition and some other mild conditions, we prove that the sequence converges to a nonisolated L-stationary point at a superlinear convergence rate.

基于$L_* - L_F$非凸优化的低秩张量补全算法

赵佩佩　　太原师范学院

报告摘要：本报告针对低 Tucker 秩张量补全问题，基于$L_* - L_F$，提出一种新的非凸优化。采用 Lagrange 乘子法，设计了三种求解新优化的高精度低秩张量补全算法。在理论方面，分析了算法的全局收敛性，在数值实验方面，针对新的非凸优化和传统的核范数凸优化，利用仿真数据和实际图像修复进行了数值实验。实验结果表明，在精度基本相同的情况下，我们所提出的算法在 CPU 时间上优于其他的高精度张量补全算法。

分组自由报告 5 连续优化

5 月 18 日 16:45 – 18:15　三楼 5 号会议室

The Newton Framework for Potentially Infeasible Nonlinear Optimization and its Application in a Multi-Start SQP Algorithm

付文豪　　苏州科技大学

报告摘要：This study investigates the local convergence properties of sequential quadratic programming (SQP) method for potentially infeasible nonlinear optimization problems using generalized equations. We propose a class of SQP methods based on the Josephy-Newton framework and extend the concept of semistability to infeasible scenarios. A class of D-stationary points (Liu and Dai, 2023) is defined under the infinity norm and quadratic/superlinear convergence of the method at potentially infeasible stationary points under semistability is established. Additionally, we design a multi-start algorithm within a filter framework, enhance its capability to avoid undesirable stationary points. Numerical experiments demonstrate the

effectiveness of the proposed methods in bypassing infeasible stationary points and detecting global minimizers.

An Inexact q-order Regularized Proximal Newton Method for Nonconvex Composite Optimization

刘儒玉　华南理工大学

报告摘要：We concern the composite problem of minimizing the sum of a twice continuously differentiable function and a nonsmooth convex function. For this class of problems, we propose an inexact q-order regularized proximal Newton method for $q \in [2,3]$, which becomes an inexact cubic regularization (CR) method for $q = 3$. We prove that the whole iterate sequence converges to a stationary point for the KL objective function. In particular, under a local Holderian error bound of order $\gamma \in (\frac{1}{q-1}, 1]$ on a second-order stationary point set, we show that the iterate and objective value sequences converge to a second-order stationary point and a second-order stationary value, respectively, with a local Q-superlinear rate of order $\gamma(q-1)$, specified as the Q-quadratic rate for $q = 3$ and $\gamma = 1$. This is the first practical inexact CR method with quadratic convergence rate for nonconvex composite optimization.

Full Splitting Algorithm for Structured Fractional Programs

陶敏　南京大学

报告摘要：In this paper, we consider a class of nonconvex and nonsmooth fractional programming problems, with nonsmooth function composed with linear operators. We propose an adaptive full-splitting proximal subgradient algorithm that addresses the challenge of decoupling the composition of the nonsmooth component with the linear operator in the numerator. We specifically evaluate the nonsmooth function in the numerator using its proximal operator of its conjugate function. We demonstrate subsequential convergence toward an approximate lifted stationary point and ensure global convergence under the Kurdyka-$Ł$ojasiewicz property, all achieved without full-row rank assumptions on the linear operators. We provide further discussions on the tightness of the convergence results of the proposed algorithm and its related variants, and the reasoning behind aiming for an approximate lifted stationary point.

Optimization with Polynomials in Diverse Forms

王杰　中国科学院数学与系统科学研究院

报告摘要：Optimization with polynomials is ubiquitous in both pure and applied mathematics. In this talk, I will give an overview on optimization problems with polynomials in diverse forms: commutative polynomial optimization, sum-of-rational-functions optimization, complex polynomial optimization, matrix polynomial optimization, noncommutative polynomial optimization. Particularly, I will show how to tackcle those difficult problems with powerful mathematical tools from measure theory, real algebraic geomatry, operator algebra, and functional analysis.

Lipschitz Continuity of Solution Multifunctions of Extended l_1 Regularization Problems

吴朋程　香港理工大学

报告摘要： In this paper we obtain a verifiable sufficient condition for a polyhedral multifunction to be Lipschitz continuous on its domain. We apply this sufficient condition to establish the Lipschitz continuity of the solution multifunction for an extended l_1 regularization problem with respect to the regularization parameter and the observation parameter without any assumption. In addition to establishing the global continuity of the solution multifunction, we partition its domain and derive explicit expressions for the multifunction within each subdivided region.

分组自由报告 6 连续优化

5 月 18 日 16:45 – 18:15　三楼 6 号会议室

Extended Vertical Tensor Complementarity Problems with Finite Solution Sets

李雪柳　广西大学

报告摘要：The main propose of the present paper is to investigate the finiteness property of the solution set for the extended vertical tensor complementarity problem (EVTCP). To this end, two classes of structured

tensor tuples, that is, vertical non-degenerate (VND) tensor tuples and strong vertical non-degenerate (SVND) tensor tuples, are introduced. Furthermore, the relationship and some properties about them are discussed. Based on the structured tensor tuples, the finiteness property of the solution set of EVTCP is investigated. The results obtained in this paper are extensions of those proposed by Palpandi and Sharma (J Optim Theory Appl190:951–965, 2021) from the tensor complementarity problem (TCP) to EVTCP.

Solution Stability and Well-Posedness for Classes of Parametric Set Optimization Problems

彭再云　　重庆交通大学

报告摘要：本文研究了参数化集优化问题（PSOP）的解稳定性和适定性，其中下集序关系和上集序关系由一个改进集诱导产生。我们给出了（PSOP）解映射的外连续性、外开放性和内开放性的新充分条件。通过利用锥连续性的性质，我们推导出了确保（PSOP）的 Levitin - Polyak 适定性以及相关半无限集优化问题（ISOP）的 Hadamard 适定性的充分条件。文中还给出了数值示例以说明主要结果。

Structured Tensor Tuples to Polynomial Complementarity Problems

商桐桐　　贵州大学

报告摘要： It is well known that structured tensors play an important role in the investigation of tensor complementarity problems. The polynomial complementarity problem is a natural generalization of the tensor complementarity problem. Similar to the investigation of tensor complementarity problems, it is believed that structured tensor tuples will play an important role in the investigation of polynomial complementarity problems. In this talk, several classes of structured tensor tuples, i.e., (strictly) semi-positive tensor tuple, (strictly) copositive tensor tuple and Q tensor tuple are introduced and the relationships between them are discussed. By using the structured tensor(s) (tuples), the uniqueness of the solution and the global upper bound of the solution set of the polynomial complementarity problem are investigated. The results presented in the present talk generalize the corresponding those in the recent literature.

稀疏矩-平方和松弛的紧性

唐新东　　香港浸会大学

报告摘要：我们考虑用于求解稀疏多项式优化问题的稀疏矩-平方和（Moment-SOS）半定松弛。在任一松弛阶数下，该半定松弛的最优值总是原问题的一个下界。当该下界等于原问题最优值时，我们称稀疏矩-平方和松弛是紧（tight）的。该性质也被称作有限收敛性。在本研究中，我们给出了稀疏矩-平方和半定松弛紧性的充分必要条件。基于这一条件，我们进一步提出了若干保证该稀疏松弛紧性的充分条件。特别地，我们证明了在凸性（convexity）、最优性条件（optimality conditions）或约束集有限性等假设下，该稀疏松弛一定是紧的。此外，我们还研究了如何使用平坦截断来获得稀疏多项式优化问题的全局最优解。

Tikhonov Regularization of Second-Order Plus First-Order Primal-Dual Dynamical Systems for Separable Convex Optimization

郑丽娟　　重庆工商大学

报告摘要：This paper deals with a Tikhonov regularized second-order plus first-order primal-dual dynamical system with time scaling for separable convex optimization problems with linear equality constraints. We obtain the convergence rate rasults and the strong convergence of the trajectory.

分组自由报告 7 连续优化

5 月 18 日 16:45 – 18:15　三楼 7 号会议室

Primal Dual Splitting Algorithms with Convex Combination and Larger Step Sizes

常小凯　　兰州理工大学

报告摘要：This talk introduces a new PDA for CMIPs, featuring the inclusion of both an extrapolation step and a convex combination step. Moreover, we shown by a constructed counterexample that, our condition on the involved parameters is sharp.

Fast Inertial Extragradient Algorithms for Solving Non-Lipschitzian Equilibrium Problems without Monotonicity Condition in Real Hilbert Spaces

邓兰梅　四川农业大学

报告摘要：Combining inertial-type methods with projection extragradient methods, we propose three inertial extragradient algorithms for solving nonmonotone and non-Lipschitzian equilibrium problems in Hilbert spaces. Under the assumption that the solution set of the associated Minty equilibrium problem is nonempty, we establish the weak and strong convergence of the proposed algorithms, respectively. The convergence is guaranteed without any monotonicity and Lipschitz-type continuity of the equilibrium bifunction. Some numerical experiments illustrate that the presented algorithms do better in CPU time and the number of iterations than the algorithms in [L.M. Deng, R. Hu, Y.P. Fang, Projection extragradient algorithms for solving nonmonotone and non-Lipschitzian equilibrium problems in Hilbert spaces. Numer. Algor. 86 (2021) 191–221] and [B.V. Dinh, D.S. Kim, Projection algorithms for solving nonmonotone equilibrium problems in Hilbert space. J. Comput. Appl. Math. 302 (2016) 106–117].

On Convergence of Iterative Thresholding Algorithms to Approximate Sparse Solution for Composite Nonconvex Optimization

胡昕霖　广东工业大学

报告摘要：非凸稀疏正则化问题已被广泛应用于改善统计偏差并提高实际应用的预测准确性，然而现有文献仅证实近端梯度算法收敛至稳定点，缺乏收敛至真实稀疏解的理论结果。我们分别结合连续技术和截断技术提出了两种类型的迭代阈值算法。通过引入一类有限收缩阈值算子并结合限制等距性条件，证明了所提出的算法收敛至近似真实稀疏解。我们将上述结果应用于带有 SCAD、MCP 和 Lp 惩罚的非凸正则化问题，并利用恢复界理论，证明了其近端梯度算法收敛到非凸正则化问题的一个近似真实稀疏解。数值结果表明算法能够找到的近似真实稀疏解，远优于使用标准。

Nonconvex Portfolio Optimization with Transaction Costs under Sparsity and Ambiguity via Accelerated ADMM

赵志华　西安电子科技大学

报告摘要： We propose a cardinality-constrained portfolio optimization model under self-defined moment-based ambiguity. Compared to chance-constrained and distributionally robust models, our model offers novel insights and superior risk oracles. We develop an accelerated ADMM method with global and local convergence rates for solving this nonconvex problem efficiently. Empirical results on real data from German and Chinese stock markets demonstrate the superior out-of-sample performance of our method.

分组自由报告 8 连续优化、统计与随机优化

5 月 18 日 16:45 – 18:15　二楼悦贵 3 厅

基于广义弹性网正则化的稀疏线性回归问题的加权迭代算法

丁彦昀　深圳职业技术大学

报告摘要：我们探讨一种基于广义弹性网正则的稀疏线性回归模型，该模型用 Lr 范数（r≥1）作为损失函数以适应不同类型的噪声，用 L_q 范数（0<q<1）替代 L_1 范数作为弹性网惩罚。理论上，我们证明该模型的局部极小点是广义一阶驻点，并推导出广义驻点的非零项的计算下界。算法上，我们利用迭代加权算法框架，结合三种局部 Lipschitz 连续的近似方法，分别提出两种优化算法。第一种算法采用 ADMM，第二种采用邻近优超极小化（PMM）算法，其中子问题用半光滑牛顿法（SNN）求解。实验结果显示两种算法均表现出优越的性能。

Accelerated Quadratic Penalty Dynamic Approaches with Applications to Distributed Optimization

何鑫　西华大学

报告摘要： In this paper, we explore accelerated continuous-time dynamic approaches with a vanishing damping α/t, driven by a quadratic penalty function designed for linearly constrained convex optimization problems. We apply the proposed dynamic approach to three distributed optimization problems.

求解多阶段随机变分不等式的松弛惯性加速算法

黄遵杰　四川师范大学

报告摘要：在本报告中，我们提出了两种求解多阶段随机变分不等式问题的数值算法。首先，我们提出了求解该问题的非精确松弛惯性逐步对冲算法，并在算子是单调和 Lipschitz 连续的条件下证明算法的收敛性。其次，我们提出了求解该问题的松弛惯性预测-校正 ADMM，并在相同的假设条件下证得算法的收敛性。最后，我们将所提的两个算法应用求解离散随机最优控制问题，数值实验结果表明所提的两个算法的可行性和有效性。

求解鲁棒优化问题的 Max-Min-Max 框架与算法

涂凯　深圳大学

报告摘要：鲁棒优化（RO）问题是一种在不确定条件下进行决策的有力模型。现有求解 RO 问题的算法,包括重构方法和切割平面法无法有效处理大规模决策问题。在本文中，我们设计了一种基于新型 Max-Min-Max 视角的一阶算法，该算法使用次梯度和投影来迭代，从而可以利用问题结构，进而适用大规模 RO 问题。理论上，取决于模型函数的光滑性，我们证明了该算法在达到ε-近似最优解时的计算复杂度为 $O(\varepsilon^{-3})$或 $O(\varepsilon^{-2})$。我们通过大量数值实验表明，所提出的算法在性能上优于重构方法、切割平面法和另外两种较新的第一阶算法。

A Class of Stochastic Differential Hemi-Variational Inequalities and its Application in Oil and Gas Development

张耀嘉　西南石油大学

报告摘要：随机微分变分不等式研究为随机环境下由微分动力系统和变分不等式约束所描述的大量现实问题提供了强有力的工具。这些问题中的非凸非光滑特性可以用半变分不等式来刻画。本次汇报拟引入并研究一类新的随机微分半变分不等式系统，为随机微分方程和随机半变分不等式的融合研究提供一个新框架。获得了随机微分半变分不等式解的存在性、唯一性及稳定性结果，并应用于一类随机环境下油气开发中的页岩气压裂液返排问题，揭示其演化规律。

分组自由报告 9 统计与随机优化

5 月 18 日 16:45 – 18:15　三楼 9 号会议室

Improving Sketching Algorithms for Low-Rank Matrix Approximation with Sketch-Power Iterations

常超　广西大学

报告摘要：Power iterations improve randomized SVD accuracy, especially for flat singular spectra, but are impractical for single-pass data like streaming or memory-limited cases. We propose a sketch-power scheme enabling power-like iterations in one pass. Stability is enhanced via lightweight re-orthonormalization on smaller matrices. Integrated into Tropp et al.'s one-pass algorithm, it reduces storage with error bounds based on sketch sizes, iterations, and tail energy. These bounds align with optimal sizes, aiding parameter preselection. Tests on synthetic and real datasets show one or two iterations significantly boost accuracy under fixed storage.

基于 MM 算法的大规模截断损失鲁棒回归方法

黄凌伟　海南大学

报告摘要：在大规模数据建模中，噪声数据常导致传统凸损失函数的鲁棒性不足。截断损失函数通过限制对异常值的最大惩罚，提升了模型的鲁棒性与样本稀疏性，因而备受关注。然而，现有基于 DC 算法的模型求解方法存在三个核心问题：(1)无法在所有截断损失中稳定保持截断机制带来的样本稀疏性；(2)子问题无法复用已有的高效凸优化工具，需额外的算法开发；(3)在大规模数据上计算效率低下甚至失效。

本研究提出基于 Majorization-Minimization 算法的截断损失鲁棒回归框架（truncated loss regression via majorization-minimization algorithm，TLRM）。其核心创新在于构造非凸截断损失的上界代理函数，将原问题转化为迭代求解原凸损失模型的 01 加权问题。具体而言，TLRM 在每次迭代中：(a)基于当前残差动态识别对应截断区域的潜在异常样本，(b) 子问题中仅使用其余正常样本构建原凸损失模型，(c)调用成熟凸优化工具高效求解。理论证明 TLRM 的迭代过程能保证目标函数单调下降，且收敛到原问题的稳定点。与 DCA 的对比分析表明，对于非线性型损失函数截断的问题（如对 Huber、LS 等损失的截断问题），DCA 分解难以在计算上识别样本稀疏性条件，导致支持向量数量无法有效缩减；而

TLRM 通过显式排除截断区域样本，可稳定保持截断机制的理论稀疏性。在优化效率方面，DCA 子问题与截断前原凸模型无显式关联，需构造新优化问题并设计求解算法；而 TLRM 的子问题与原凸模型同构，可直接复用现有高效求解器以实现加速。

实验部分验证了 TLRM 的稀疏性、高效性和可扩展性：在人工数据和基准数据集上，TLRM 相较 DCA 实现最高 4 个数量级的加速，且支持向量数量减少至多八成。在大规模场景下，TLRM 成功处理了高达百万级数据集，而 DCA 在仅 2 万工作集的数据上就因内存溢出无法完成计算。

本研究建立了截断损失回归与原始凸损失回归的桥梁，为实际工程中的鲁棒回归问题提供了高效解决方案。未来工作将拓展 MM 框架到其他截断非凸损失场景，并研究自适应、非对称等截断阈值选择机制。

Distributionally Robust Mean-CVaR Portfolio Optimization with Cardinality Constraint

王爽　内蒙古大学

报告摘要：In this talk, we consider the situation where the true distribution of underlying uncertainty is unknown for a mean-CVaR model with cardinality constraint. We develop a distributional robust mean-CVaR model with cardinality constraint (DRMCC) and construct the ambiguity set by moment information. We propose a discretization approximation to the moment-based ambiguity set and present the stability analysis of the optimal values and optimal solutions of the resulting discrete optimization problems as the sample size increases. We reformulate the DRMCC model as a bilevel optimization problem. Moreover, we propose a modified bilevel cutting-plane algorithm to solve the DRMCC model. Finally, some preliminary numerical test results are reported. We give the in-sample performance and out-of-sample performance of the DRMCC model.

Robust Personalized Federated Learning for High-dimensional Linear Regression

王鑫　北京交通大学

报告摘要：Multi-source data analysis is a hot topic in modern statistics research. Its purpose is to obtain accurate estimates by mining multiple sets of data. This field covers a range of approaches such as federated

learning, transfer learning, and fusion learning. This paper proposes a robust personalized federated learning method to address the regularized quantile regression models with data heterogeneity. We propose a alternating direction method of multipliers based personalized federated learning algorithm to minimize the global optimization model. Theoretically, the basic convergence of the algorithm and the statistical properties of the estimators are established. Simulations and real data analysis confirm the effectiveness of the proposed method.

Wasserstein Distributionally Robust Equilibrium Optimization under Random Fuzzy Environment for the Electric Vehicle Routing Problem

殷方浩　山东财经大学

报告摘要： This paper innovatively combines the empirical distribution characteristics of random fuzzy variables to propose a new Wasserstein distributionally robust equilibrium optimization method and effectively applies to an electric vehicle routing problem with contactless delivery. The proposed method characterizes customer demand and travel time in EVRPCD as random fuzzy variables with ambiguous probability distributions. Moreover, this studied EVRPCD integrates the location decision of the contactless delivery station and the routing decision of the electric vehicle, thus forming a bi-level optimization. As the proposed method faces significant computational challenges, this paper theoretically deduces its computable reformulation via utilizing the dual theory and the credibility measure method.

A Neural Network Based on Back-Propagation and Cooperative Co-Evolution

张玉明　北方民族大学

报告摘要： Deep neural networks (DNNs) excel at feature extraction, making them widely applicable. While back-propagation (BP) is the dominant training method, it suffers from initialization sensitivity and local optima convergence. To address this issue, a hybrid framework combining BP with cooperative co-evolution (CC) has been proposed, called BPCC. BP operates intermittently, while CC activates only when loss differences fall below a threshold (called a condition met). To improve efficiency, a tolerance parameter is designed, i.e., CC is executed when the cumulative number of times the condition is satisfied reaches the

given value of the tolerance parameter. The improved gray wolf optimizer (GWO) drives CC, with population diversity enhanced via Chebyshev chaotic map initialization around the current optimum, Experimental comparisons are made with modern network training methods in 7 network models, and the experimental results show that the improved algorithm in this study is competitive.

分组自由报告 10 整数规划与组合优化

5 月 18 日 16:45 – 18:15　二楼悦贵 2 厅

用于因果结构学习的非精确列生成法

陈锐　香港中文大学（深圳）

报告摘要：因果结构学习旨在从数据中推断因果关系，其组合优化本质导致其计算复杂度极高。现有的整数规划模型因变量和约束数量随着数据维度增长而指数级增长，而其对应的列生成方法则受困于混合整数非线性规划（MINLP）定价问题的复杂性。为了处理列生成中复杂的定价问题，我们将定价问题重构为次模函数差优化问题，提出了一种非精确列生成方法。该方法在保障生成列质量的同时，显著降低了定价子问题的计算复杂度。实验表明，当因果结构较为复杂时，该方法在解质量与计算效率上均优于纯整数规划方法（如 GOBNILP）。

Packing Small Stars into Bounded Degree Graphs

韩娜　华东理工大学

报告摘要： We study the maximum $\{S_1, S_3\}$(resp. $\{S_2, S_3\}$)-packing problem in general bounded degree graphs. First, we design an $O(v(G)^2)$-time algorithm to generate an $\{S_1, S_3\}$-packing of G covering at least $\min\{\frac{4v(G)}{d+1}, \frac{2v(G)}{3}\}$ vertices for any graph G with maximum degree $d \geq 3$ and show that this bound is tight. Second, we prove that the same algorithm produces an $\{S_1, S_3\}$-packing of any cubic graph G covering at least $\frac{4v(G)}{5}$ vertices. Third, for any (2,3)-regular graph G with $v(G) \geq 4$, we propose a more elaborate $O(v(G)^4)$-time algorithm to find an $\{S_1, S_3\}$-packing of G covering at least $\frac{4v(G)}{5}$ vertices and prove that this

lower bound is tight. Finally, we came up with an $O(v(G)^3)$-time algorithm to produce an $\{S_2, S_3\}$-packing of any graph G with maximum degree $d \geq 3$ covering at least $\frac{4v(G)}{2d+1}$ vertices and show the tightness of this bound.

混合整数凸优化问题的信息复杂性

江弘亿　　香港城市大学

报告摘要：本文研究了混合整数凸优化问题在不同类型预言机下的信息复杂性问题。混合整数凸优化涉及同时包含整数变量和连续变量的凸函数最小化，广泛应用于资源分配、生产规划和网络设计等领域。信息复杂性衡量的是算法找到近似最优解所需的最少查询次数，这对理解问题的计算难度和设计高效算法至关重要。传统上，混合整数凸优化的研究主要依赖于完整一阶信息预言机，即能提供完整函数值、次梯度和分离超平面信息的预言机。本文不仅改进了在这种标准设置下的理论界限，还首次系统研究了在部分信息预言机下的优化复杂性。作者为标准一阶预言机下的混合整数凸优化问题建立了更严格的下界，使其与已知最佳上界的差距仅剩维度上的线性项。本文的核心贡献是提出了一个"转移"定理，证明连续凸优化在不同预言机下的信息复杂性下界可以系统地转移到混合整数设置中。具体而言，如果连续问题有某个下界，那么有 n 个整数变量的混合整数问题的下界会呈指数级增长，与 2^n 成正比。这一定理的证明采用了巧妙的难例构造方法：在每个整数点纤维上插入的连续难例，然后在纤维之间进行适当插值，使得算法必须单独处理每个纤维上的优化问题，从而导致询问次数的指数增长。本研究进一步分析了多种部分信息预言机：位信息预言机只能查询二进制表示的特定位；位移位预言机允许查询移位后的函数值位信息；内积阈值查询可以检查次梯度与某向量的内积是否超过阈值；通用二元预言机则允许对次梯度或分离超平面进行任何二元查询。作者不仅理论分析了这些预言机的信息复杂性下界，还设计了在这些受限信息下进行优化的有效算法。在算法设计方面，研究利用中心点技术开发了适用于不同预言机的优化方法。中心点是凸集中的特殊点，通过它的任何超平面都会切除集合的显著体积。基于此特性，作者设计的算法通过反复在中心点处应用分离或次梯度切割，能在有限次迭代内保证收敛到近似最优解。对于位信息和内积阈值查询，研究详细说明了如何通过有限次查询近似实现分离预言机和次梯度预言机。本研究不仅深化了对混合整数凸优化计算复杂性的理解，还为实际算法设计提供了指导，尤其是当完整一阶信息难以获取时。研究结果表明，在设计混合整数优化算法时，必须考虑整数变量带来的指数级复杂度增长，并根据可用信息类型选择适当的优化策略。

An Exact Dynamic Programming Algorithm for Multi-Objective Flexible Process Planning

罗开平　北京航空航天大学

报告摘要：Flexible process planning (FPP) is a key component of modern manufacturing. However, exact algorithms for FPP remain underexplored. This study proposes a compact mixed-integer linear programming (MILP) model and an optimal dynamic programming (DP) algorithm for multi-objective FPP based on AND/OR networks. The proposed model introduces candidate states, avoiding explicit modeling of manufacturing resource changeovers and eliminating separate models for production time and cost optimization. The DP algorithm uses labels to encode partial solution information, identifies feasible subsequent operations for each label, and integrates a dominance rule to discard non-useful labels, enhancing efficiency while maintaining optimality. Experimental results demonstrate the robust performance of the DP algorithm. In single-objective tests, it identifies 23 best-known optimal solutions and achieves a threeorder magnitude reduction in computation time compared to the latest MILP models. In multiobjective tests, it determines all Pareto optimal plans within one minute on average, underscoring its practical value in revealing trade-offs between conflicting objectives for informed decisionmaking.

DNA 分子网络的构建及其在 0-1 整数规划和疾病诊断中的应用

唐震　上海工程技术大学

报告摘要：DNA 计算的巨大并行性、耗能小等优势，使得 DNA 计算被广泛用于信息安全、逻辑电路、复杂数学问题求解、生物检测和神经网络等领域。基于 DNA 分子的化学反应网络作为 DNA 计算的重要手段之一，它可以作为一种有效的编程语言在分子计算、纳米技术和生物医学等领域以多种方式存储和处理信息。而当前的 DNA 反应网络只能执行逻辑运算、概率推理、布尔矩阵乘法以及方程求解等问题，难以用于求解 NP 问题。因此，我们在前人研究的基础上，基于 DNA 链置换反应设计功能型的反应模块，比如加权、阈值和乘法等反应模块，选择相应的反应模块组成 DNA 反应网络，使之可以用于求解 0-1 整数规划问题等复杂数学问题。而通过观察 0-1 整数规划问题、0-1 背包问题和最大团问题的数学表达式不难发现，这些问题的核心都是由一个或多个线性方程以及不等式临界值组成，这个正是加权、求和、阈值反应模块所能实现的运算功能，我们所设计的 DNA 反应网络在求解这些问题时是通用的，有理由相信我们搭建的 DNA 反应网络可以有效地解决这些问题，进一步拓宽 DNA 反应网络的计算范围，提高 DNA 反应网络的计算深度。

整数规划问题的快速局部搜索算法

邹蒙川　　中国科学院软件研究所

报告摘要：Mixed integer programming (MIP) is a fundamental model in operations research. Local search is a powerful method for solving hard problems, but the development of local search solvers for MIP still needs to be explored. We develop an efficient local search solver for solving MIP, called Local-MIP. We propose two new operators for MIP to adaptively modify variables for optimizing the objective function and satisfying constraints, respectively. Furthermore, we design a new weighting scheme to dynamically balance the priority between the objective function and each constraint, and propose a two-level scoring function structure to hierarchically guide the search for high-quality feasible solutions. Experiments are conducted on seven public benchmarks demonstrate that Local-MIP significantly outperforms CPLEX, HiGHS, SCIP and Feasibility Jump, and is competitive with the most powerful commercial solver Gurobi. Moreover, Local-MIP establishes 4 new records for MIPLIB open instances.

分组自由报告 11 优化应用与软件

5 月 18 日 16:45 – 18:15　三楼 11 号会议室

四元数张量 Tensor-Train 分解的算法研究

陈治剑　　广西大学

报告摘要：张量的 Tensor-Train 分解能有效的将数据降维而受到广泛关注。本报告主要研究四元数张量的 Tensor-Train 分解的算法；第一种是串行架构的 TT-SVD 算法，第二种是并行架构的 TS-SVD 算法。此外本报告还给出了两种算法在给定 TT-rank 和给定精度两种情形下的误差分析。最后数值例子验证了两种分解算法的正确性。

梦境优化算法（DOA）：一种受人类梦境启发的新型元启发式优化算法及其在实际工程问题中的应用

郎一凡　北方民族大学

报告摘要：本文提出一种新型元启发式优化算法——梦境优化算法（Dream Optimization Algorithm，DOA），灵感来源于人类梦境中的记忆保留、遗忘与自组织特性。DOA 设计了三项关键策略：基础记忆、遗忘与补充机制（用于平衡探索与开发）及梦境共享机制（增强跳出局部最优能力）。通过对搜索轨迹、种群多样性等方面的定性分析，验证了 DOA 对不同复杂度问题的适应能力。在 CEC2017、CEC2019 和 CEC2022 三组基准测试中将 DOA 与 27 种算法进行比较，结果显示 DOA 在多项性能指标上均表现优异。此外，DOA 还在八个工程约束优化问题及光伏电池模型参数优化中取得最优结果，展现了其实际应用价值。

Support Matrix Machine: Exploring Sample Sparsity, Low Rank, and Adaptive Sieving in High-Performance Computing

吴灿　海南大学

报告摘要：Support matrix machine (SMM) is a successful supervised classification model for matrix-type samples. When solving a large-scale SMM, a major challenge arises from the potential increase in sample size, leading to substantial computational and storage burdens. To address these issues, we design a semismooth Newton-CG (SNCG) based augmented Lagrangian method (ALM) for solving the SMM. The sparsity of samples and the low-rank nature of solutions enable us to reduce the computational cost and storage demands for the Newton linear systems. Additionally, we develop an adaptive sieving strategy that generates a solution path for the SMM by exploiting sample sparsity. The finite convergence of this strategy is also demonstrated. Numerical experiments on both large-scale real and synthetic datasets validate the effectiveness of the proposed methods.

$l_{1/2}$-norm Enhanced Adversarial Training for Multiple Perturbations

徐芳芳　山东科技大学

报告摘要：Adversarial Training (AT) plays an important role in defending against adversarial attacks. It can be formalized as a min-max optimization problem. At present, the existing adversarial training approaches

often use l_1, l_2 and $l_{infinity}$ norms to constrain the perturbations. However, we find that deep learning models are highly sensitive to $l_{infinity}$ perturbations. In order to improve the defence of the model against $l_{infinity}$ perturbations, this paper introduces l_p $(0 < p < 1)$ norm into adversarial training, and proposes l_p norm-based multi steepest descent algorithm. Through experiments we find that l_p-MSD algorithm works best when p is equal to 1/2. Furthermore, experimental results show that the robustness of the model is improved by 10.34% compared to traditional multi steepest descent algorithm. Finally, we carry out a perturbation selection experiment to explore the contribution of the $l_{1/2}$ norm during the training.

分组自由报告 12 优化应用与软件

5 月 18 日 16:45 – 18:15　二楼悦华 1 厅

Inertial Riemannian ADMM for Non-convex Pose Graph Optimization in SLAM

陈鑫　　北京航空航天大学

报告摘要： Pose graph optimization is a well-known technique for solving the pose-based simultaneous localization and mapping (SLAM) problem. In this paper, we propose a new model based on the von Mises-Fisher distribution. The constraints derived from the unit quaternions are spherical manifolds. Then an inertial Riemannian alternating direction method of multipliers is developed to solve the proposed model, which combines the inertial step with over-relaxation technique for updating the primal and dual variables. Instead of using linearization techniques, the subproblem on spherical manifolds is equivalent to an eigenvalue problem and has a closed solution. Our algorithm not only has low memory requirements, but also can update the poses in parallel. Furthermore, we establish the convergence analysis of our algorithm for finding the stationary point of our model. The efficiency of our proposed algorithm is demonstrated by numerical experiments on several benchmark datasets.

A Riemannian Smoothing Nonmonotone Conjugate Gradient Method for t-product based l_1-norm Tensor Principal Component Analysis

毛显鹏　广西大学

报告摘要： T-product based tensor principal component analysis (L2-tPCA) reduces dimensionality while preserving essential features but is sensitive to outliers. To address this, L1-norm tPCA (L1-tPCA) was recently introduced, showing robustness against heavily corrupted data. From an optimization perspective, L1-tPCA maximizes a nonsmooth function over the tensor Stiefel manifold. This study proposes tRSCG, a Riemannian smoothing conjugate gradient method that adaptively updates the smoothing parameter. We prove any accumulation point of tRSCG in a certain index set is a stationary point of the smoothing function, necessary for local optimality in L1-tPCA. Under reasonable assumptions, we establish the Riemannian gradient consistency property, showing these points are Riemannian limiting stationary—stronger than existing methods that only ensure Riemannian Clarke stationary points. Finally, experiments confirm tRSCG's efficiency and effectiveness.

Lightweight Deep Unfolding RPCA with Enhanced Robustness for Infrared Small Target Detection

修贤超　上海大学

报告摘要： Deep unfolding networks have demonstrated promising performance in infrared small target detection due to their high interpretability and excellent feature extraction capabilities. However, existing methods still face critical challenges in computational efficiency and noise sensitivity. To address these limitations, this paper proposes a lightweight deep unfolding network based on robust principal component analysis, denoted as RPCANet+. Specifically, we introduce an intermediate bottleneck layer to improve the efficiency of feature extraction and embed a denoising module to enhance the robustness to noise. In addition, we leverage squeeze-and-excitation networks as a channel attention mechanism to focus on the importance differences of features between channels, thereby achieving good detection performance with lightweight and robustness. Extensive experiments validate the effectiveness and its superiority over state-of-the-art methods.

On Quaternion Higher-Order Singular Value Decomposition: Models and Analysis

牙韩欣　广西大学

报告摘要：高阶奇异值分解（HOSVD）是张量数据分析的著名工具。最近，基于四元数矩阵左乘，HOSVD 的顺序版本被推广到四元数域。另一方面，由于理论问题，可以并行运行的经典 HOSVD 不能直接推广到四元数。在这项工作中，我们提出了一种双边四元数 HOSVD（TS-QHOSVD），可以在两个处理器中并行化，加速其计算。结果表明，HOSVD 的有序性仍然适用于 TS-QHOSVD，而正交性仅适用于第一和最后两种模式。然而，弱正交性在所有模式下仍然成立。然后介绍了截断的 TS-QHOSVD，并建立了由尾部能量测量的误差界限。与真实或复杂的情况不同，重建的张量可能不是$\sqrt{N}$-次优解，并且可能在所有模式下都不是低秩的。最后，我们提供了数值例子来说明 TS-QHOSVD 的导出性质和截断 TS-QHOSVD 的有效性。

A Difference of Convex Functions Regularization Approach for 3D Tensor Visual Data Completion

张本鑫　桂林电子科技大学

报告摘要：In this paper, we propose a new model with a novel nonconvex tensor rank surrogate function measure under limited sample constraint and bound constraint, where the nonconvex terms have a difference of convex functions structure and can better explore the global low-rank characteristics. A proximal difference of convex functions algorithm is also developed to solve the non-convex model, whose explicit solution can be obtained. Using variation analysis tools, we prove that the sequence generated by the proposed algorithm converges to a stationary point under very mild conditions.Comprehensive experimental results demonstrate that the new method is effective.

分组自由报告 13 其他

5 月 18 日 16:45 – 18:15　二楼悦华 2 厅

四元数低秩正则化方法及其在彩色图像恢复中的应用

金其余　内蒙古大学

报告摘要：针对传统彩色图像复原方法在处理 RGB 通道间相关性不足，导致色彩失真和伪影的问题，本文引入了两种基于四元数的新型正则化方法，以提升彩色图像复原的性能。首先，我们提出了四元数核范数减去弗罗贝尼乌斯范数最小化（QNMF），利用四元数代数全面捕捉 RGB 通道间的关系，并通过核范数减去弗罗贝尼乌斯范数的正则化技术，近似四元数编码彩色图像的潜在低秩结构。我们提供了理论证明，确保该方法的数学严谨性，并验证了 QNMF 在彩色图像去噪、去模糊、图像修复和随机脉冲噪声去除等多个低层视觉任务中的优异性能，达到了最先进的结果。其次，为了解决从不完整或含噪数据中恢复隐藏结构的问题，我们提出了四元数核范数比弗罗贝尼乌斯范数（QNOF）作为四元数矩阵秩的非凸近似。QNOF 具有无参数和尺度不变的特性。通过四元数奇异值分解，我们证明了求解 QNOF 可以简化为求解奇异值 L1/L2 问题。此外，我们将 QNOF 扩展到鲁棒的四元数矩阵补全，并采用交替方向乘子法推导解决方案，保证在温和条件下弱收敛。大量的数值实验验证了所提出的模型优越性，始终优于最先进的四元数方法。综上所述，本文提出的 QNMF 和 QNOF 方法，通过引入四元数代数和新型正则化技术，有效解决了彩色图像复原和四元数矩阵补全中的关键挑战，为多维数据表示和处理提供了新的有效工具。

Existence and Uniqueness of Solutions of Generalized Mixed Polynomial Variational Inequalities

刘建勋　广西民族大学

报告摘要：This report investigates the generalized mixed variational inequality (GMVI), a framework that unifies generalized variational inequalities (GVIs) and mixed variational inequalities (MVIs). The primary contributions of this study are two-fold:

1. By leveraging degree theory, we derive sufficient conditions for the existence of solutions to GMVI. Furthermore, we establish a criterion to ensure the uniqueness of these solutions, providing a theoretical foundation for analyzing GMVI in general settings.

2. Recognizing that the conditions derived for GMVI are not directly applicable to GMPVI—a specialized subclass of GMVI. This enables us to formulate an existence and uniqueness theorem tailored specifically to GMPVI, addressing the challenges posed by non-strong monotonicity.

为可持续供应商选择与订单分配设计全局鲁棒供应链工作

王昕　河北大学

报告摘要：在供应链管理领域，供应商选择与订单分配是关键的战略决策，对产品定价和质量有着显著影响。本文研究了一种在参数不确定性下的可持续供应商选择与订单分配问题，旨在平衡四个相互冲突的目标：成本、二氧化碳排放、社会影响以及供应商的综合价值。为应对运输成本、二氧化碳排放和需求等不确定参数带来的挑战，提出了一种新颖的全球化鲁棒目标规划模型。该模型引入优先级水平以反映决策者的偏好，并采用内外不确定性集合来有效处理多重不确定性。所提出的模型被转化为一种计算上可行的混合整数线性规划形式，确保了实际应用的可行性。通过钢铁行业的一个案例研究，我们展示了该模型在实现鲁棒且可持续解决方案方面的有效性。结果突出了该模型在平衡冲突目标的同时保持对不确定性的韧性，为可持续供应链管理提供了重要价值。

The Statistical Analysis of Zero-Inflated Weibull Model

肖翔　上海工程技术大学

报告摘要：In order to timely detect the risk of theft of financial and insurance accounts, this article proposes a zero-inflated Weibull distribution model. Through objective Bayesian analysis, the Jeffreys and reference priors of the parameters are derived in detail, and corresponding sampling mechanisms are designed. By setting different sample sizes and parameter truth values, numerical simulations were conducted on parameter estimation, and good estimation results were achieved. There is currently very little research on the zero-inflated phenomenon of continuous probability distribution, the article enriches the research results in this field.

Predefined-time Robust Neurodynamic Models for Solving Absolute Value Equations

于冬梅　辽宁工程技术大学

报告摘要： The inverse-free neurodynamic dynamic models and predefined-time robust gradient neural network (PRGNN) for solving absolute value equations (AVEs) are investigated to solve the absolute value equations (AVEs). Under certain conditions, the equilibrium points of the dynamical system exist and could be (globally) asymptotically stable. PRGNN achieves predefined-time convergence and exhibits complete resilience against bounded vanishing or bounded non-vanishing noise. Compared with existing continuous time models,PRGNN can achieve better noise-tolerance performance under large constant noise.Numerical results illustrate the effectiveness of the presented methods.

在网络中阻断密集集群

钟昊男　云南财经大学

报告摘要：在一个带有顶点权重的无向图中，每个顶点和边都具有阻断成本。目标是找到一个最小成本的顶点和边子集，使得在被阻断后的图中，任何γ-准团的权重都不超过某个预设的阈值参数。参数γ∈(0,1]表示关注的网络中紧密连接的顶点群体的边密度。所研究的加权γ-准团阻断问题可以看作是文献中已有的多个团阻断问题变体的自然推广。从应用的角度来看，该问题主要受到破坏对抗性网络（如社交网络或通信网络）需求的激励，其中γ-准团代表了“紧密联系”的对抗性群体，而目标是拆散这些群体。利用其可行解的一些基本特征，推导出一个线性整数规划。

上海工程技术大学简介

上海工程技术大学（Shanghai University of Engineering Science）是工学见长，管理学和艺术学特色鲜明，工学、管理学、艺术学、法学、理学、医学、经济学、文学等多学科互相渗透、协调发展的全日制普通高等学校，是教育部“卓越工程师教育培养计划”首批试点高校、全国地方高校新工科建设牵头单位、上海市“高水平地方应用型高校”试点建设单位。2024 年获批博士学位授予单位及机械工程一级学科博士学位授权点。

学校的前身为创建于 1978 年的上海交通大学机电分校（其中华东化工学院分院于 1984 年编入上海交通大学机电分校）和华东纺织工学院分院，1985 年经教育部批准，在上海交通大学机电分校和华东纺织工学院分院的基础上，正式成立上海工程技术大学。2003 年经上海市人民政府批准，上海市高级技工学校（创建于 1951 年）整体划入上海工程技术大学。

学校拥有松江、长宁、虹口等校区，占地 1308 亩，总建筑面积 72.51 万平方米，固定资产总额约 35.83 亿元，教学科研仪器约 13.95 亿元。现有机械与汽车工程学院、电子电气工程学院、管理学院、化学化工学院、材料科学与工程学院、艺术设计学院、国际创意设计学院、航空运输学院（飞行学院）、纺织服装学院、城市轨道交通学院、数理与统计学院、外国语学院、马克思主义学院、国际教育学院、继续教育学院、高等职业技术学院、体育教学部、工程训练中心、通识教育中心等教学机构，拥有国家级实验教学示范中心、国家级虚拟仿真实验教学中心和国家大学科技园。

学校建立了本科、硕士到博士完整的人才培养体系，现有一级学科博士学位授权点 1 个；一级学科硕士学位授权点 15 个；专业学位硕士专业学位授权点 12 个，本科专业 63 个；机械工程、车辆工程、计算机科学与技术、信息管理与信息系统、工商管理、市场营销、旅游管理、化学工程与工艺、制药工程、环境工程、产品设计、服装设计与工程、交通运输共 13 个专业入选国家级一流本科专业建设点；汽车服务工程、能源与动力工程、电气工程及其自动化、广播电视工程、自动化、工程管理、劳动与社会保障、高分子材料与工程、材料成型及控制工程、材料科学与工程、视觉传达设计、艺术与科技、交通管理、物流管理、飞行技术、飞行器制造工程、纺织工程、轨道交通信号与控制、铁道工程共 19 个专业入选上海市一流本科专业建设点；制药工程、环境工程、交通运输、服装设计与工程、化学工程与工艺、机械工程、自动化、计算机科学与技术、车辆工程、材料科学与工程、高分子材料与工程 11 个专业通过中国工程教育认证；车辆工程（城市轨道交通车辆）、轨道交通信号与控制、铁道工程、能源与动力工程 4 个专业通过德国 ASIIN 认证，交通管理、飞行器制造工程 2 个专业通过美国 AABI 认证。

学校致力于深化教育教学改革，提高人才培养质量。坚持依托现代产业办学、服务经济社会发展的办学宗旨，以现代产业发展需求为导向，学科群、专业群对接产业链和技术链，以产学研战略联盟

为平台，与行业、企业共同构建了协同办学、协同育人、协同创新的“三协同”模式、“一年三学期，工学交替”的产学合作教育模式，助力学校成为培养优秀工程师和工程服务人才的摇篮。现有全日制在校生近 24900 名，其中硕士研究生近 4950 名。毕业生具有显著的就业优势，受到用人单位普遍欢迎。

学校不断推进科研管理体制改革、深化科教融汇与产教融合，科研核心创新力持续增强。五年来首次获批科技部科技创新 2030——“新一代人工智能”重大项目、研究阐释党的十九届六中全会精神国家社科基金重大项目、教育部哲学社会科学研究重大课题委托项目、国家自科基金重大研究计划培育项目、国家自科基金联合基金重点项目、国家社科基金重点项目及高校思想政治理论课研究专项重点项目等，共获批各类国家级项目 174 项，其中国家自然科学基金项目 119 项、国家社会科学基金项目 49 项等。获得省部级及以上科研奖励 51 项，实现了省部级一等奖的突破。在美国斯坦福大学和爱思唯尔（Elsevier）发布的第七版《年度全球前 2%顶尖科学家榜单》中，我校 8 位学者入选“终身科学影响力排行榜”、16 位学者入选“2024 年度科学影响力排行榜”。学校注重平台建设与多元合作，协同创新中心、研发公共服务平台、工程技术研究中心、政府决策咨询研究基地、高校智库等省部级平台达 21 个。学校融合科技项目增势喜人，知识产权质量加速提升。2020 年至今，获发明专利授权 1245 项，以专利许可、专利转让和科技成果作价入股等形式实现科技成果转移转化项目 240 余项。

学校把造就一支高素质、高水平的人才队伍作为重中之重。现有教职工 2000 余人，其中从事教学、科研的教师 1500 余人，博士占比超过 60%。各类国家级人才 25 名，省部级人才及上海市各类人才项目获批者 150 余人，享受国务院政府特殊津贴专家 10 人。

学校秉承开放办学的理念，积极引进国际优质教育资源助力学校内涵建设和学生培养。目前，学校已与美国、加拿大、墨西哥、德国、英国、法国、意大利、瑞典、瑞士、韩国、日本、新加坡、马来西亚、哈萨克斯坦、巴基斯坦等 30 多个国家和地区 110 余所高校或机构建立合作关系。设有一个非独立法人中外合作办学机构国际创意设计学院和一个中瑞合作办学项目，为学生提供了博士联合培养、硕士双学位、本硕学位、本科双学位、学分互认、毕业设计、国际组织实习、国际产学合作、寒暑期短期学习、国际友城等 120 多个国（境）外学习交流项目，打造了丰富多样的国（境）外学习交流平台。学校主动服务国家“一带一路”倡议，积极开展与沿线国家高校的教育合作交流，共接收了全球 90 余个国家和地区的国际学生来校攻读学位、短期交流和语言培训。

伴随着我国高等教育全面深化改革与发展的进程，学校正以习近平新时代中国特色社会主义思想和党的二十届三中全会精神指导学校教育事业的改革发展，扎根中国大地办大学，培养担当民族复兴大任的高素质工程应用型人才，在建设国内一流的高水平现代化工程应用型特色大学征程上自信前行。上海工程技术大学热忱欢迎您的到来！

松江校区（主校区）地址：上海市松江区龙腾路 333 号，邮编：201620

长宁校区地址：上海市长宁区仙霞路 350 号，邮编：200335

虹口校区地址：上海市虹口区逸仙路 88 号，邮编：200434

上海工程技术大学数理与统计学院简介

上海工程技术大学数理与统计学院的前身是成立于 1978 年的基础教学部，1995 年为适应学校发展，更名为基础教学学院，2017 年为全面深化学校综合改革，进一步提升数学、物理学和统计学等一级学科的学科建设水平，更好地支撑现代化工程应用型特色大学的建设与发展，更名为数理与统计学院。

学院下设大学数学系、应用统计系、应用数学系、大学物理系、光电物理系、物理实验中心、党政办公室和学生工作办公室。学院设有数据计算及应用（全国首家）和光电信息科学与工程 2 个本科专业，拥有统计学和光学工程 2 个一级学科硕士学位授权点、应用数学与计算科学（自设）二级学科硕士学位授权点以及应用统计专业硕士学位授权点，2021 年起与马来西亚双威大学（Sunway University）联合培养博士研究生。目前，在校本科生 420 人，研究生 255 人。

学院现有教职工 110 人，其中专任教师 96 人，教授 16 人，副教授 36 人，具有博士学位 80 人，国务院特殊津贴专家 2 人，全国优秀科技工作者 1 人，教育部新世纪人才 1 人，博士生导师 2 人，硕士生导师 119 人（含兼职导师 56 人）。教师中多人被授予宝钢教育基金优秀教师、上海市新长征突击手和上海市育才奖等荣誉称号，学院多次被授予学校先进集体。

学院承担我校研究生和本科生数理类平台课程、基础课程和专业课程的教学任务。建设高等数学、线性代数、概率论与数理统计、大学物理等校级本科生精品课程以及数理统计及工程应用、多元统计分析、应用随机过程等校级研究生精品课程。学院重视学生综合素质的提升，积极开展第二课堂活动，在学生创新能力培养上强化自己的特色。积极组织学生参加中国研究生数学建模竞赛、全国大学生数学建模竞赛、美国大学生数学建模竞赛、全国大学生高等数学竞赛、全国大学生市场调查与分析大赛、全国大学生统计建模大赛、全国大学生光电设计竞赛、全国大学生物理实验竞赛、全国部分地区（上海赛区）大学生物理竞赛和深圳杯全国数学建模夏令营活动等学科竞赛，并取得优异成绩。特别地，2017 年至今，我校研究生累计获得中国研究生数学建模竞赛全国一等奖 13 项、全国二等奖 269 项和全国三等奖 459 项，历年获奖总名次稳居全国前列。

学院参与建设上海市心脑血管非编码 RNA 成药性前沿科学研究基地（培育），拥有上海市 AI+联合创新工作室、校级智能计算与应用统计研究中心、计算物理及其应用研究中心以及数学建模创新实验室、数据计算实验室、光电信息科学与工程实验室和物理实验室等，实验室面积 4000 余平方米，具有价值 1800 余万元的先进教学科研仪器。学院积极开展产学研合作，获批教育部“1+X”职业技能等级证书试点单位，与上海金仕达软件科技有限公司、广州泰迪科技智能有限公司、深兰科技（上海）有限公司、上海市激光技术研究所、中科悦达（上海）材料科技有限公司和上海玫克生储能科技有限公司等企业以及国家统计局松江调查队和松江统计局等政府部门签署产学研战略合作协议，校企共建

金融统计与风险管理应用联合实验室、生物统计与数智医疗应用联合实验室和大数据与人工智能工作室等。

学院重视国际交流与合作，选派优秀教师赴美国加州大学伯克利分校、美国宾州州立大学、新加坡国立大学、澳大利亚科廷大学、新加坡南洋理工大学等著名高校做访问学者，提高教师的科研能力和国际影响力。与华东师范大学、上海财经大学、厦门大学、同济大学、东华大学、上海大学等国内著名高校保持密切的学术交流与合作关系。学院柔性引进名誉教授 1 名（美国宾州州立大学）、海外名师 2 名（荷兰代尔夫特理工大学和澳大利亚科廷大学）和海外教师 1 名（美国乔治亚南方大学）。

2017 年至今，学院教师获得上海市自然科学二等奖 3 项和三等奖 1 项，上海市科技进步奖三等奖 1 项；承担国家自然科学基金重点项目、面上项目、青年科学基金、教育部留学回国人员启动基金、上海市自然科学基金、上海市晨光计划、上海市青年科技英才扬帆计划等 70 余项，累计科研经费 1600 余万元；承担横向课题 40 余项，到款金额达 400 余万元；第一作者或通讯作者发表 SCI 收录高水平科研论文 250 余篇，其中入选 ESI 全球 TOP 1%高被引论文 4 篇，中科院二区及以上 70 余篇；发明专利授权 8 项；出版学术专著 5 部。在上海市运筹学会和上海市质量技术应用统计学会的支持下，统计学学科连续组织八届统计与运筹青年学者论坛，极大促进了统计学与运筹学等学科的交叉与融合。

学院始终坚持“提升基础教学质量为立院之本，强化理工交叉融合为强院之路”的发展理念，不断巩固本科教学的基础地位，深化教育教学改革，创新人才培养模式，优化学科专业布局，完善课程体系建设，强化实践育人环节，健全质量保障机制。展望未来，学院发展潜力巨大，前景鼓舞人心。按照学校第三次党代会确立的“新三步走”奋斗目标，学院大力实施“人才强校、特色发展、国际化”三大发展战略，为实现学院和学校跨越式可持续发展而团结奋斗！

酒店、会场相关地图

上海富悦大酒店 & 上海松江世茂睿选酒店 & 维也纳酒店（万达广富林路店）交通建议

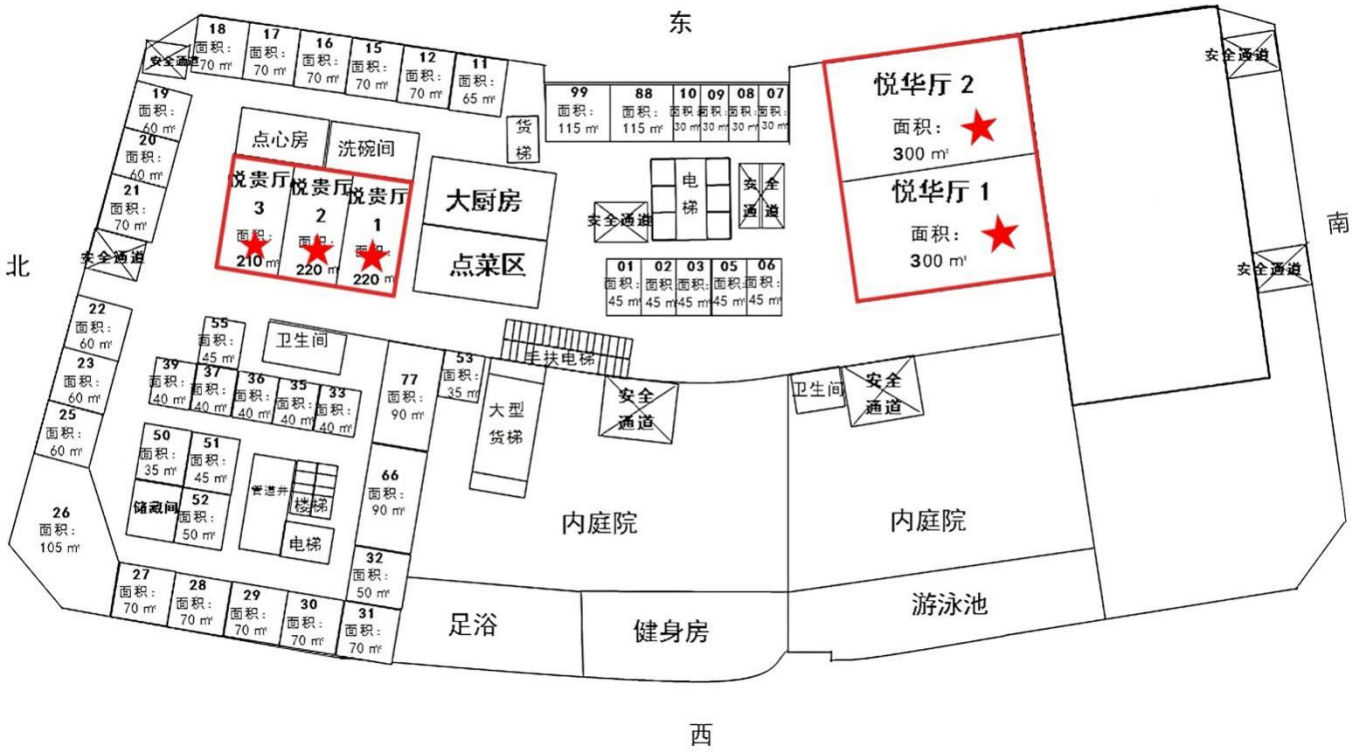
站名	坐车路线	交通时间
上海松江站（火车站）	乘坐出租车约 40 - 50 元	约 30 分钟
	地铁 9 号线（松江大学城站 1 号口）→ 换乘出租/网约车（约 2-2.5 公里）	约 30 分钟
	富悦：地铁 9 号线（松江大学城站 1 号口）→ 松江客运中心换乘公交松江 66 路/1803 路（光星路银泽站）→ 向东步行 569 米 **世茂：**地铁 9 号线（松江大学城站 1 号口）→ 有轨电车 2 号线内圈（光星路站）→ 向东步行 358 米 **维也纳：**地铁 9 号线（松江大学城站）→ 有轨电车 2 号线内圈（茸惠路站）→ 向西步行 353 米	约 50 分钟
上海虹桥站（火车站）	乘坐网约车约 70 元	约 40 分钟
	市域机场线（中春路站）→ 换乘地铁 9 号线（松江大学城站 1 号口）→ 换乘出租车（约 2 - 2.5 公里）	约 60 分钟
	富悦：市域机场线（中春路站）→ 换乘地铁 9 号线（松江大学城站 1 号口）→ 松江客运中心换乘公交松江 66 路/1803 路（光星路银泽路站）→ 向东步行 569 米 **世茂：**市域机场线（中春路站）→ 换乘地铁 9 号线（松江大学城站 1 号口）→ 有轨电车 2 号线内圈（光星路站）→ 向东步行 358 米 **维也纳：**市域机场线（中春路站）→ 换乘地铁 9 号线（松江大学城站 1 号口）→ 有轨电车 2 号线内圈（茸惠路站）→ 向西步行353 米	约 80 分钟
上海虹桥国际机场（机场）	乘坐网约车约 80 元	约 40 分钟
	市域机场线（中春路站）→ 换乘地铁 9 号线（松江大学城站 1 号口）→ 换乘出租车（约 2 - 2.5 公里)	约 60 分钟
	富悦：市域机场线（中春路站）→ 换乘地铁 9 号线（松江大学城站 1 号口）→ 松江客运中心换乘公交松江 66 路/1803 路（光星路银泽路站）→ 向东步行 569 米 **世茂：**市域机场线（中春路站）→ 换乘地铁 9 号线（松江大学城站 1 号口）→ 有轨电车 2 号线内圈（光星路站）→ 向东步行 358 米 **维也纳：**市域机场线（中春路站）→ 换乘地铁 9 号线（松江大学城站 1 号口）→ 有轨电车 2 号线内圈（茸惠路站）→ 向西步行 353 米	约 80 分钟

上海南站 **（火车站）**	乘坐网约车约 70 元	约 35 分钟
	地铁 15 号线（桂林路站）→ 换乘地铁 9 号线（松江大学城站 1 号口）→ 换乘出租车（约 2 - 2.5 公里)	约 70 分钟
	富悦：地铁 15 号线（桂林路站） → 换乘地铁 9 号线（松江大学城站 1 号口）→ 松江客运中心换乘公交松江 66 路/1803 路（光星路银泽路站）→ 向东步行 569 米 **世茂：**地铁 15 号线（桂林路站） → 换乘地铁 9 号线（松江大学城站 1 号口）→ 有轨电车 2 号线内圈（光星路站）→ 向东步行358 米 **维也纳：**地铁 15 号线（桂林路站）→ 换乘地铁 9 号线（松江大学城站 1 号口）→ 有轨电车 2 号线内圈（茸惠路站）→ 向西步行353 米	约 90 分钟
上海站 **（火车站）**	乘坐网约车约110 元	约 55 分钟
	地铁 1 号线（汉中路站）→ 换乘地铁 12 号线（嘉善路站）→ 换乘地铁 9 号线（松江大学城站 1 号口）→ 换乘出租车（约 2 - 2.5 公里)	约 90 分钟
	富悦：地铁 1 号线（汉中路站）→ 换乘地铁 12 号线（嘉善路站）→ 换乘地铁 9 号线（松江大学城站 1 号口）→ 松江客运中心换乘公交松江 66 路/1803 路（光星路银泽路站）→ 向东步行 569 米 **世茂：**地铁 1 号线（汉中路站）→ 换乘地铁 12 号线（嘉善路站） → 换乘地铁9 号线（松江大学城站 1 号口）→ 有轨电车 2 号线内圈（光星路站）→ 向东步行 358 米 **维也纳：**地铁 1 号线（汉中路站）→ 换乘地铁 12 号线（嘉善路站）→ 换乘地铁 9 号线（松江大学城站 1 号口）→ 有轨电车 2 号线内圈（茸惠路站）→ 向西步行 353 米	约 100 分钟
上海浦东国际机场 **（机场）**	乘坐网约车约110 元	约 55 分钟
	市域机场线（中春路站）→ 换乘地铁 9 号线（松江大学城站）→ 换乘出租车（约 2 - 2.5 公里)	约 90 分钟
	富悦：市域机场线（中春路站）→ 换乘地铁 9 号线（松江大学城站 1 号口）→ 松江客运中心换乘公交松江 66 路/1803 路（光星路银泽路站）、→ 向东步行 569 米 **世茂：**市域机场线（中春路站）→ 换乘地铁 9 号线（松江大学城站 1 号口）→ 有轨电车 2 号线内圈（光星路站）→ 向东步行 358 米 **维也纳：**市域机场线（中春路站）→ 换乘地铁 12 号线（嘉善路站）→ 换乘地铁 9 号线（松江大学城站）→ 有轨电车 2 号线内圈（茸惠路站）→ 向西步行 353 米	约 105 分钟

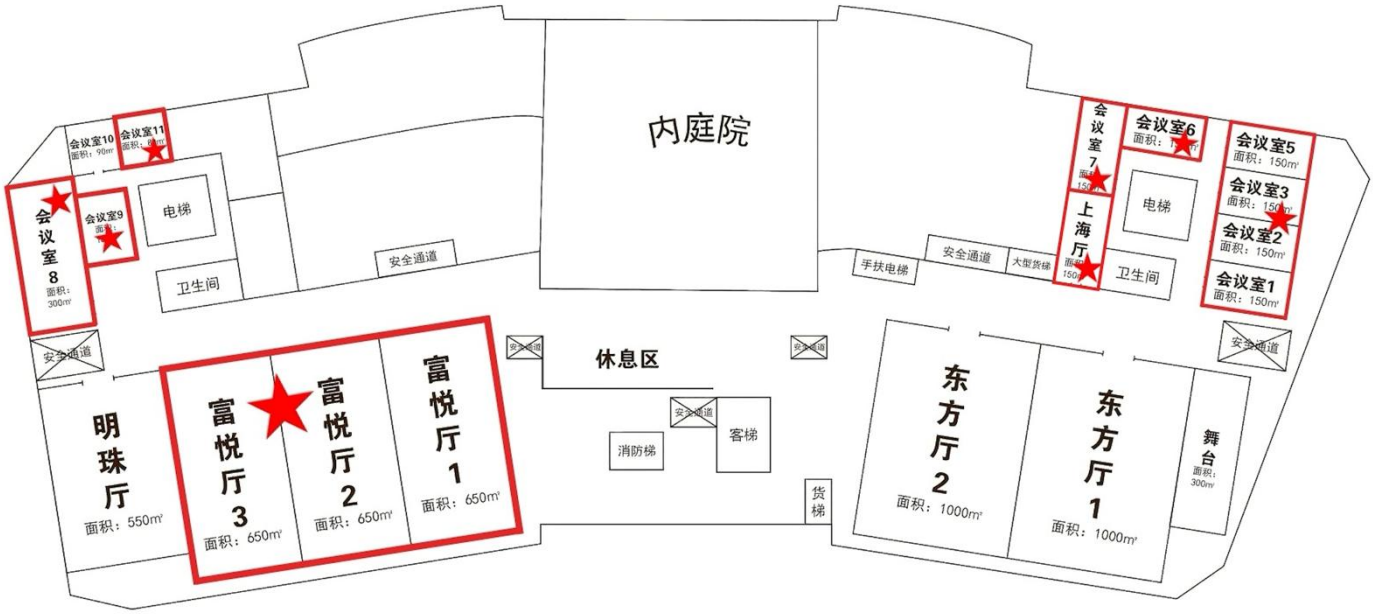
会场（富悦酒店）会议厅、餐厅地图

一 楼 平 面 图

二 楼 平 面 图



三 楼 平 面 图



群聊：MOS2025会议群-1

该二维码7天内(5月17日前)有效，重新进入将更新

群聊：MOS2025会议群-2

该二维码7天内(5月17日前)有效，重新进入将更新

会议笔记

MOS 2025