



# 复杂系统与网络科学研究中心

Research Center for Complex Systems and Network Sciences

## 第三十九届复杂系统与网络科学研究中心论坛

### The Thirty-ninth Workshop of Research Center for Complex Systems and Network Sciences

# 程序册

论坛资助:

东南大学十大科学与技术问题专项-“网络群体智能”  
东南大学卓越引智计划-“数学与人工智能交叉创新引智计划”  
国家自然科学基金委

主办: 江苏省网络群体智能重点实验室 数学学院  
复杂工程系统测量与控制教育部重点实验室 自动化学院  
复杂网络应用与安全研究中心 网络空间安全学院  
江苏国家应用数学中心 东南大学  
中国指挥与控制学会网络科学与工程专业委员会  
中国工业与应用数学学会复杂网络与  
复杂系统专业委员会



**Inquiry:** Wenwu Yu 虞文武 ([wwyu@seu.edu.cn](mailto:wwyu@seu.edu.cn))、

Duxin Chen 陈都鑫 ([chendx@seu.edu.cn](mailto:chendx@seu.edu.cn))



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## 第三十九届复杂系统与网络科学研究中心论坛 The Thirty-ninth Workshop of Research Center for Complex Systems and Network Sciences

时间：2020年6月27日，周六（14:00-17:00）

会议方式：：“腾讯会议”线上视频会议

会议号：772 210 887

会议链接：<https://meeting.tencent.com/s/uQsfs4oCSTGg>

开幕介绍致辞 虞文武 14:00-14:10

论坛 I 陈都鑫（主持）

“可弯曲混凝土”的发展与挑战

鲁聪 东南大学 14:10 – 14:40

**Data-driven Modelling Approach in Energy Management System**

**Chaojie Li The University of New South Wales 14:40 – 15:10**

**Modelling and Approximation in Complex Networked Systems**

**Xiaodong Cheng Eindhoven University of Technology 15:10 – 15:40**

论坛 II 孟浩飞（主持）

**Output Synchronization of Multi-Agent Systems with Time-Delay and Unknown Leader Dynamics**

**Yamin Yan The University of Newcastle 15:50 – 16:20**

基于约束一致性算法的电网经济调度研究

刘骁康 Nanyang Technological University 16:20 – 16:50

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### “可弯曲混凝土”的发展与挑战

鲁聪（东南大学）

#### Abstract

2019 年我国混凝土产量为 25.5 亿立方米，超过全球其他国家产量总和。传统混凝土具有以下不足：断裂韧度低，易开裂；裂后耐久性差，严酷环境下易劣化；延性低，易脆性破坏。为解决以上问题，上世纪末密歇根大学的 V. C. Li 等人基于细观断裂理论研发了一种高延性水泥基复合材料（简称 ECC），其推广应用是解决混凝土开裂、提升结构耐久性和抗震性能的重要途径。ECC 材料在拉弯荷载下呈现多缝开裂、应变硬化的特性，延性可达传统混凝土的数百倍、普通 FRC 的数十倍、钢筋的数倍，被誉为可弯曲的混凝土。同时，ECC 可将极限荷载下的裂缝宽度控制在 80 微米以下，且具有自愈合能力，因此极大地提高了结构的抗渗透性能和耐久性能，是当今高性能材料的一个重要研究领域。近年来，这种材料凭借其优异的力学性能，已在国内外的实际工程中得到应用，但也面临着巨大的技术瓶颈和挑战，值得我们关注和研究。

#### About the Speaker



鲁聪，男，工学博士，国家“青年千人”特聘教授，入选江苏省双创人才计划、南京留学人员择优资助项目。2012 年本科毕业于东南大学土木工程学院，博士师从香港科技大学土木环境系梁坚凝教授，研究方向为新兴的高性能纤维增强水泥基复合材料（ECC）。其间在港府资助下前往美国密歇根大学访问八个月，合作导师是 ECC 发明者 Victor C. Li 教授，2016 年博士毕业后历任香港科技大学博士后，东南大学土木工程学院副研究员，现任东南大学土木工程学院教授。主持国家十三五计划子课题，国家自然科学基金青年项目 2 项国家级科研课题，作为骨干参与 3 项香港政府资助科研项目（RGC/GRF），参与编写行业标准 2 部，在 Journal of Cement and Concrete Research、Journal of Cement and Concrete Composites、Engineering Structures 等期刊发表 SCI 论文 20 余篇，三年内引用 200 余次，同时为本领域多个主流期刊审稿服务。

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## **Data-driven Modelling Approach in Energy Management System**

**Chaojie Li** (The University of New South Wales)

### **Abstract**

Big data analysis has been widely applied to capturing business opportunities involving human behaviour modelling which enables a more realistic solution for engineering practitioners in energy management problems. This talk will present a tutorial on how to model the problems of energy management from a data-driven perspective. Moreover, the efficient computational algorithms for solving complicated optimisation model will be discussed in a large-scale. Game theoretical models will be highlighted for challenging issues including demand side management, demand response of EV management, multi-energy trading mechanism design and distributed renewable energy integration in the smart grid while the corresponding highly efficient computational algorithms will be introduced for solving these challenges in a distributed way.

### **About the Speaker**

Dr. Chaojie Li received the B.Eng. degree in electronic science and technology and the M. Eng. Degree in computer science from Chongqing University, China, in 2007 and 2011, respectively, and received the PhD. Degree from RMIT University, Australia in 2017, where he was a research fellow for one and a half years. He worked as a senior algorithm engineer at Alibaba group for one year. At present, He is a senior research associate at UNSW at Sydney. His current research interests include graph representation learning, distributed optimization and game theory in smart grid, big data analysis, and cyber security.

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## Modelling and Approximation in Complex Networked Systems

Xiaodong Cheng (Eindhoven University of Technology)

### Abstract

Complex networked systems are becoming ever more prevalent in our society. The term ‘complex’ refers to large-scale topological features of the interactions as well as high-dimensional dynamics from different physical domains. The overwhelming complexity of these systems poses significant challenges in the systems and control domain how to effectively and efficiently analyse and control these systems. In this report, I will briefly introduce my research on scalable modelling and complexity reduction in dynamic networked systems. The first part considers identifiability problem in complex networks, which aims to allocate external excitation signals such that all the dynamics in a network can be identified from data. The second part is focused on model-order reduction of structured networked systems that is to reduce the dimension of a complex network system while retain all the salient structures and dynamics in the network avoiding unnecessary redundancy.

### About the Speaker

Xiaodong Cheng is a postdoctoral researcher with the Department of Electrical Engineering, Eindhoven University of Technology, the Netherlands. He received the B.S. and M.S. degrees in School of Electronics and Information from Northwestern Polytechnical University, Xi'an, China, in 2011 and 2014, respectively. In November 2018, he received the Ph.D. degree (with distinction cum laude) in systems and control from the University of Groningen, the Netherlands. His main research interests include model reduction, distributed control, and identification of networked systems. He is the recipient of the Paper Prize Award of IFAC Journal Automatica in 2020.

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## **Output Synchronization of Multi-Agent Systems with Time-Delay and Unknown Leader Dynamics**

**Yamin Yan** (The University of Newcastle)

### **Abstract**

In this talk, we study the output synchronization problem for linear heterogeneous discrete-time multi-agent systems in a leader-following architecture. The major technical challenges lie in the mix of input time-delays and unknown leader dynamics. To handle unknown leader dynamics, an observer is required for each follower to estimate both a leader's state and its system dynamics. It results in an adaptive distributed observer-based approach subject to input-delays.

### **About the Speaker**

Dr. Yamin YAN received her B. Eng. Degree in 2013 from Wuyuzhang Honorary College, Sichuan University, and the PhD degree in 2017 from the Chinese University of Hong Kong. She is currently a research associate at the University of Newcastle, Australia. Her research interests include distributed control, networked systems, output regulation, and security control.





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### 基于约束一致性算法的电网经济调度研究

刘骁康（南洋理工大学）

#### Abstract

经济性是电力系统运行的一大重要指标，其中发电端的经济调度问题一直是一个热门研究课题。在经济调度问题中，不仅需要发电量满足用电量需求，同时还需要所有分布式发电端的发电成本总和最小。在现有分布式经济调度算法中，常需额外的一致性变量来获取全局信息，以弥补投影算子施加后导致的功率不匹配问题。基于此，提出了一类初值重置的迭代优化算法来搜索每个发电端的最优增益成本，采用了有限时间的一致性算法并仅在实现一致性后施加投影算子重置初值。该算法能够减少优化过程中对投影函数的调用次数，并能够更快地实现收敛，同时无需设置额外的一致性变量来补偿功率。

#### About the Speaker



刘骁康，男，1992年8月出生，新加坡南洋理工大学博士后。2019年毕业于华中科技大学，师从王燕舞教授，并获得控制科学与工程专业博士学位。2017年7月-2018年8月赴美国罗德岛大学访问学习。2018年11月-2019年2月赴新加坡南洋理工大学能源研究院访问学习。2019年6月-2019年9月赴中科院系统科学研究所访问学习。于2019年10月赴新加坡南洋理工大学大学电气与电子工程学院从事博士后研究工作。近年来，发表各类学术论文18篇，其中SCI学术期刊论文10篇，EI期刊/国际会议8篇。目前从事研究包含：多智能体系统的协同控制，直流微电网的控制与优化等。