专题 3：智能技术及其应用

张　玺：基于传感数据网络的温度场动态估计研究与应用

（Spatiotemporal transfer learning for dynamic thermal field estimation）

Dr. Xi Zhang is an associate professor at the department of industrial engineering and management, Peking University. He received his B.S. degree in mechanical engineering from Shanghai Jiaotong University, 2006, and the Ph.D. degree in industrial engineering from the University of South Florida, 2010, respectively. His research interests focus on the field of engineering data analytics, with an emphasis on integration of data analytics and engineering physics for process monitoring, diagnosis/prognostics, and optimization, which has been implemented in the fields of advanced manufacturing and healthcare delivery, etc. His research has been evidenced by high quality journal papers and the best paper award/finalist in a broad of research communities including IIE, Robotics & Automation Society and INFORMS. His research has been funded by NSFC, MOST, MOE, etc. He is the member of INFORMS, IIE, IEEE and ASQ.

摘要：Estimation of dynamic field provides a prerequisite opportunity to understand the dynamics of complex systems in many areas. By combining the data collected from sensor networks, the accuracy of the estimation could be greatly improved. This talk focuses on modeling such dynamic process by analyzing the collected sensing signals from the sensor networks and integrating the physical dynamics of the process. Generally, we model the spatiotemporal dynamics of a temperature field by borrowing a spatiotemporal Gaussian process. Results of the studies give some insights into the spatiotemporal dynamics of a temperature field and provide guidance to the optimum design of engineering structures to conserve energy and reduce production cost.

吴建国：数据驱动的先进制造过程建模、监测与控制

Data-driven Modeling, Monitoring and Control of Advanced Manufacturing for Quality and Reliability Improvement

Dr. Jianguo Wu is an Assistant Professor of Industrial Engineering and Management Department at Peking University. Before joining Peking University, he was an Assistant Professor at the Department of Industrial, Manufacturing and Systems Engineering, University of Texas at El Paso, USA from 2015 to 2017. He received the B.S. degree in Mechanical Engineering from Tsinghua University in 2009, the M.S. degree in Mechanical Engineering from Purdue University, USA in 2011, and M.S. degree in Statistics in 2014 and Ph.D. degree in Industrial and Systems Engineering in 2015, both from University of Wisconsin-Madison, USA. His research focuses on statistical modeling, monitoring, diagnostics and prognostics of advanced manufacturing processes, engineering and service systems for quality control and reliability improvement through integrated application of metrology, engineering domain knowledge and advanced data analytics. He is the recipient of STARS award from the University of Texas System in 2015, and the “Thousand Talents Program” for Distinguished Young Scholars from the Organization Department of China in 2017.

摘 要： Advanced manufacturing is featured by the advanced manufacturing processes, advanced materials and products, and smart manufacturing, and it has been widely regarded as the future of manufacturing. To fulfill the promise of advanced manufacturing, it is critically important to bring the prototype fabrication processes and advanced products from lab environment to a scale-up industrial mass production. However, due to the process novelty, complexity and many unclear physical mechanisms, there is often lack of effective process and quality control methodologies for many emerging fabrication processes, which is one major barrier for the scale-up production. Thanks to the development of sensing and information technology, the manufacturing becomes more and more data-intensive, which provides unprecedented opportunities for data-driven process monitoring and quality control technology development. In this talk, Dr. Wu will briefly share his research in advanced data analytics with applications to high performance lightweight metallic nanocomposites manufacturing and 3D printing.

罗国杰：智能计算的定制加速器

罗国杰，北京大学高能效计算与应用中心副教授，北京大学高能效计算与应用中心副主任，北京大学信息科学技术学院特聘研究员。罗国杰 2005 年获得北京大学计算机科学技术系理学学士学位，并分别于 2008 年和 2011 年获得美国洛杉矶加州大学计算机科学系理学硕士和博士学位。他曾获 2013 年 ACM/SIGDA 杰出博士论文奖、2017 年 ASP-DAC 十年最具影响力论文奖。自 2011 年 8 月，他加入北京大学信息科学技术学院高能效计算与应用中心。他目前的研究兴趣包括电子设计自动化、基于 FPGA 及新型器件的异构计算、以及医学图像分析算法。

摘要：当前兴起的新一代人工智能应用对计算能力和计算能效提出了挑战。为解决新的挑战，研究者从神经网络结构、算法优化、硬件结构等多个方面陆续展开了探索。高能效计算与应用中心在新一代人工智能应用兴起的早期，在定制计算加速器领域，从可重构设计以及软硬件协同优化等角度提出若干解决方案，启发了一批后继工作。我们将在此次演讲具体介绍高能效中心在智能计算的定制加速器的成果与展望。

刘　哲：与伦理协调的自主和智能系统发展

Ethically Aligned Development of Autonomous and Intelligent Systems

刘哲：北京大学哲学系副教授，国家万人计划青年拔尖人才。主要研究领域：德国古典哲学、现象学、心灵哲学和主体性理论（意识与自我意识问题）。现受国家标准化委员会国家机器人标准化总体组委托设计和起草《中国机器人伦理白皮书》。

摘要：According to The Robotics and Automation Society of the IEEE , Robotics focuses on systems incorporating sensors and actuators that operate autonomously or semi-autonomously in cooperation with humans. Robotics research emphasizes intelligence and adaptability to cope with unstructured environments. EURON (European Robotics Research Network) defines Robotics as a new science. Insofar as the gestalt shifts in one's image of the world are indispensable in new science, the ethical concern must of necessity constitute one of the major driving forces in the future development of both autonomous and intelligent systems. Roboethics is such rational cross-disciplinary research that means to fix the ethical insufficiency in the rapid scientific and technological progress of Robotics in the current world. International institutes and governments in other countries have already made great efforts to address profound ethical concerns for Robotics. Chinese government is also taking action to draft the Chinese White Paper for the Ethics of Robotics. I thus propose here that the advance of AI and Robotics in PKU must be ethically aligned in close cooperation with philosophy and some of other humanity disciplines.

贾积有：教育与人工智能

贾积有，北京大学教育学院教育技术系教授，博士生导师；北京大学教育信息化国际研究中心主任。德国慕尼黑工业大学、香港公开大学客座教授。教育部新世纪优秀人才支持计划（2009）。北大理学学士、教育学硕士，德国奥格斯堡大学哲学博士。

研究领域：教育技术学、人工智能教育应用、教育决策支持系统、计算机辅助语言教学等。受邀三十余次在国际和国内学术研讨会报告科研成果，在国培等全国和省市级教师培训会议上作报告。主持和参与十多项国内外重要科研项目。撰写或者主编五本汉语、英语、德语专著，在国内外重要期刊和国际重要会议等场合发表教学和科研论文百余篇。荣获十多次国内外教育和人工智能研究等领域的科研和教学奖项，包括 2008 年国际人工智能促进协会（AAAI）第 20 届创新应用年会 “创新应用部署奖”、2016 年第五届全国教育科学研究优秀成果一等奖、北京大学教学优秀奖等。

学术兼职：全国教育科学规划基金评审专家，全国和北京市数字化校园建设咨询专家，教育部研究生和学位中心评审专家，中国教育技术协会信息技术教育专业委员会常务理事。多本 SCI/SSCI 期刊审稿人，多次国际会议联合主席等。

摘要：人工智能在最近几年的突破性进展和在教育领域的广泛应用，引起了社会各界、特别是教育界的极大关注。本报告将围绕教育与人工智能关系这一核心问题，从教育学、教育技术、教育经济学、人工智能、技术哲学等多学科的视角，全方位分析教育、技术与人工智能的复杂关系，分析人工智能在教育领域的应用案例，探讨人工智能前沿技术在教育领域应用的可能性和影响。

熊英飞：Learning to Synthesize Programs

熊英飞，北京大学信息学院“百人计划”研究员，主要研究内容为软件工程和程序设计语言。在软件工程顶级会议 ICSE、FSE、ASE 上发表论文十余篇，并获得中国大陆在软件分析顶级会议 ISSTA 上的首篇 ACM SIGSOFT Distinguished Paper Award，负责包括青年 973 在内的多个项目，并在 ASE 等顶级会议上担任 PC。

摘要：In many scenarios we need to find the most likely program under a local context, where the local context can be an incomplete program, a partial specification, natural language description, etc. We call such problem program estimation. In this paper we propose an abstract framework, learning to synthesis, or L2S in short, to address this problem. L2S combines four tools to achieve this: syntax is used to define the search space and search steps, constraints are used to prune off invalid candidates at each search step, machine-learned models are used to estimate conditional probabilities for the candidates at each search step, and search algorithms are used to find the best possible solution. The main goal of L2S is to lay out the design space to motivate the research on program estimation.

We have performed a preliminary evaluation by instantiating this framework for synthesizing conditions. On 4 projects from Defects4J, we can successfully synthesize the correct conditions at top 10 in 64.7%-85.7% of the cases by training only on the source code of the project, and the precision is related to the size of the projects.

许辰人：面向无源物联网应用的可见光散射通信技术

Dr. Chenren Xu (http://ceca.pku.edu.cn/chenren) is a tenure-track Assistant Professor in the School of EE&CS and a member of CECA at Peking University. He received his Ph.D. from WINLAB, Rutgers University, and his B.E. from Shanghai University. He has held postdoctoral and visiting positions at Carnegie Mellon University and AT&T Shannon Labs. He is the recipient of Gold Medal of Samsung Best Paper Award, Best Paper Nominee Award of ACM UbiComp'14 and Best Poster Award of ACM SenSys'11. His research interests focus on wireless networking from the system perspective, including high mobility data networking, battery-free backscatter communication and affective computing.

摘 要： This talk presents PassiveVLC, a ultra-low power communication subsystem for IoT connectivity. It is based on the idea of modulating the light retroreflection with a commercial LCD shutter to realize a passive optical transmitter and thus visible light backscatter communication. PassiveVLC system enables a battery-free tag device to perform passive communication with the illuminating LEDs over the same light carrier, is flexible with tag orientation, robust to ambient lighting conditions, and can achieve up to 1 kbps uplink speed.

赵东岩：文本大数据分析及其智能应用

赵东岩，北京大学计算机科学技术研究所研究员，博士生导师。主要研究方向为自然语言处理、大规模语义数据管理、知识服务技术。近年来承担国家级项目 15 项、主持 7 项，发表学术论文 100 余篇（包括 AAAI、ACL、SIGMOD、VLDB、VLDB Journal、TKDE 等顶级会议和期刊），授权发明专利 15 项、申请 10 项，先后五次获得国家和省部级奖励。个人获第十届中国青年科技奖（2007 年）和北京市第七届“科技之光”技术创新特别奖等荣誉。计算机学会（CCF）高级会员，CCF 中文信息技术专委会秘书长、CCF 大数据专家委员会委员、CCF 网络与数据通信专委会委员。

摘要：文本是人类记录和传播知识与信息的重要载体。在大数据时代，如何对大规模文本进行语义分析和理解是自然语言处理及人工智能领域的一个前沿课题，众多国际一流研究机构和 IT 企业投入大量资源进行相关研究与开发工作。本次报告将系统阐述文本大数据分析的研究路线、核心问题及讲者的研究实践，并结合工业界需求，介绍相关技术在人工智能领域的应用。

彭宇新：跨媒体智能分析与应用

彭宇新，北京大学二级教授，博导，863 首席专家，中国人工智能产业创新联盟专家委员会主任委员，中国工程院“人工智能 2.0”规划专家委员会专家等。2006 年入选教育部新世纪优秀人才支持计划和北京市科技新星计划，2016 年获北京市科学技术一等奖（排名第一）。主要研究方向是跨媒体分析与推理，图像视频理解与检索等。发表论文 100 多篇，包括 IJCV，TIP，TCSVT，TMM，PR，CVPR，ICCV，ACM MM 等。6 次参加由美国国家标准技术局 NIST 举办的 TRECVID 视频语义搜索比赛均获得第一名。主持研发的互联网多模态内容分析与识别系统已应用于公安部、国家新闻出版广电总局等单位。人工智能顶级国际会议 AAAI 2016、IJCAI 2015 及国际会议 ICIP 2017 等领域主席。

摘要：信息传播已经从文本、图像、视频、音频等单一媒体形态过渡到相互融合的跨媒体形态。人脑对外界的认知过程是跨越多种感官信息的融合处理，如何通过视觉、听觉、语言等信息认知客观世界，成为了跨媒体智能分析的主要研究问题。本报告将对“人工智能 2.0”中跨媒体智能分析的主要任务进行介绍，涵盖了跨媒体表征、挖掘、推理和知识演化等，并介绍我们的研究进展与应用成果。