

## 庞智博

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个人主页: <https://www.kth.se/profile/zhibo>

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谷歌学术: <https://scholar.google.com/citations?user=S14M7yMAAAAJ&hl=en>



### 个人信息

姓名: 庞智博      性别: 男      职位: 双聘教授/资深主任科学家  
单位: KTH 瑞典皇家工学院/ABB 集团瑞典研究院

### 研究方向

1. 智能机器人的感知、控制和安全交互
2. 智能机器人与自动化系统
3. 网络化和虚拟化的工业控制基础设施

### 简历

#### 学术简历

庞智博, PhD&MBA, 2002 年中国浙江大学电子工程学士、2012 年芬兰图尔库大学创新与增长专业 MBA、2013 年瑞典皇家工学院 KTH 电子与计算机系统专业 PhD, 曾在中欧商学院、英国曼城大学商学院、法国巴黎 ESCP 商学院、比利时索尔维商学院访问学习。现任瑞典皇家工学院 KTH 双聘教授, 同时担任国际自动化与电气巨头 ABB 集团资深主任科学家 (全球研发专家序列里第二高的级别, 由 CTO 任命, 领导全集团工业通讯学科的研究战略、技术路线、能力建设和关键项目), 曾任澳大利亚悉尼大学兼任教授。在加入 ABB 之前, 他曾是 Ambigua Medito AB 等初创公司的联合创始人兼首席技术官。

庞博士是 IEEE 高级会员, IEEE 物联网社区指导委员会委员、IEEE 工业电子学会 (IES) 管理委员会委员, IEEE IES 工业行动委员会委员、IEEE IES 工业云与无线系统技术委员会主席、IEEE IES 工业信息学技术委员会共同主席, 他还是 IEEE Transactions on Industrial Informatics、IEEE Journal of Biomedical and Health Informatics、IEEE Transactions on Consumer Electronics、IEEE Transactions on Sustainable Computing、IEEE Journal of Emerging and Selected Topics in Industrial Electronics 和 IEEE Internet of Things Magazine 等著名学术期刊副编。他还是美国国家标准与技术研究院 (NIST) 组织的工业无线工作组和 IEEE P3388 标准工作组创始成员、IEEE P2805 工业边缘技术标准工作组成员。他曾在中国、瑞典、英国、澳大利亚、西班牙等国 8 所大学担任兼任教授或博士生工业导师。

庞博士作为大会主席组织了 2017 年 IEEE 国际复杂组织系统大会 ES2017 (清华大学承办)、2021 年 IEEE 工业通信系统会议 WFCS2021 (奥地利林茨大学承办)、2025 年 IEEE 工业信息学大会 (INDIN2025)。他还受邀在戈登研究会议 Gordon Research Conference on Advanced Health Informatics (AHI2018) 上做大会演讲, 其他大会演讲还有加拿大皇家科学院时任院长 Jamal Deen 院士、瑞典卡罗林斯卡医学院时任校长 Ole Ottersen 教授、《Science Robotics》创刊主编杨广中院士等世界顶尖学者。除此之外, 他在 IEEE IECON、ICC、IoT World Forum、INDIN、ISIE、ICIT、ETFA、ICPS、WFCS、GLOBECOM、WCNC、6G Summit、VTC、5G World Forum 等著名国际学术会议上做了超过 45 次的主题演讲或特邀演讲。

庞博士在人工智能、机器人、网络化控制、云雾计算、工业信息物理安全、工业网络、无线通信、实时嵌入式系统等领域造诣深厚, 众多成果应用于业界领先产品, 如 ABB Ability CMD 工业动力系统云端监测系统、ABB 移动 Yumi 协作机器人、日立能源超高压电力电子控制系统、日立能源 TropOS 电网控制网络、ABB free@home 和 Welcome IP 建筑自动化系统、ABB WirelessHART 过程自动化等, 这些产品在全球实现了数百万台/件安装, 为企业创收数亿欧元。

庞博士共主持或核心参与了十多项包括欧盟地平线计划 H2020、瑞典国家创新署基金、瑞典国家战略研究基金、ABB 集团研究基金在内的科研项目, 累计经费超过 900 万欧元。他有 35 项已授权发明专利 (包括 23 项美欧日专利), 120+篇国际期刊论文 (绝大部分发表于一区和顶级期刊如 PIEEE、IEEE TII、IEEE TIE、IEEE IEM、IEEE JSAC、IEEE JBHI、IEEE IoTJ、IEEE TWC、IEEE WCM、Willy AIS、IEEE/CAAJAS 等, 其中 6 篇曾入选 ESI 高引用论文、7 篇被选为期刊封面) 和 60+篇国际会议论文, 40+次国际会议主旨或特邀报告 (比如 IEEE ICC、GLOBECOM、WF-IoT、IEEE 5G World Forum、WCNC、VTC Spring、IECON、INDIN、ISIE、ICPS、ICIT 等 IEEE 官方会议)。

从 2020 年开始, 庞博士连年入选斯坦福大学“全球前 2% 顶尖科学家年度影响力榜单”, 并在多个学科位于上榜科学家前 1%, 包括电气与电子工程前 0.3% (2022)、人工智能与图像处理前 0.7% (2022)、

网络与电信工程前 0.7% (2021)。据 Google Scholar 统计 (S14M7yMAAAAJ), 论文共被引用 9200 多次, 单篇最高引用 830 多次, H 指数 46。

庞博士在 2016、2018、2021 年三次获得 ABB 集团瑞典研究院“年度发明人奖”(每年仅 1 人)。他还带领团队获得了 2022 年度 ABB 全球过程自动化黑客大赛二等奖, 他指导的研究生获得了 IEEE ISIE2024、IEEE ICIRA2023、IEEE IECON2022 等著名国际会议论文竞赛奖和瑞典自动化行业组织 Swedish Automation 颁发的 2022 年度自动化学生奖。此前, 他还获得了 2008 年北欧 RFID 技术博览会 (RFID Nordic EXPO) 竞赛单元第一名, IEEE-ICACT2013 国际学术会议杰出论文奖, 2006 年浙江省科学技术奖二等奖 (第五完成人), 2005 年中国工信部授予的“国家信息产业重大技术发明奖”(第四完成人)。

他曾担任欧盟研究基金 European Research Council (ERC)、荷兰国家研究基金 Dutch Research Council (NWO)、智利国家研究基金 (CONICYT-Chile) 等政府重大项目评审专家。

## 自我介绍

我是一个对工业数字化转型充满热情的创新者和研究领导者, 拥有在大学、大型公司和初创企业中超过 20 年的经验。贯穿整个创新周期, 我曾担任愿景领导者、概念创造者、资源调查员、跨组织协调员、技术导师、核心程序员、产品经理和客户沟通者等角色。我专注于机器人、人工智能、控制、计算、通信和电子学领域的关键技术, 致力于推动工业 4.0 和医疗 4.0 的发展。

## 关键词

具身智能、AI/LLM/LFM/机器学习、机器人、云-雾自动化、信息物理系统、网络安全、功能安全、工业 4.0、医疗 4.0、物联网、无线高性能、云/边缘计算、控制系统、无线通信、片上系统、FPGA/ASIC、过程自动化、电力网、生物信息学

## 亮点

拥有 23 项在美国/欧洲/日本授予的专利, 发表了 120 多篇期刊论文、60 多篇会议论文, 进行了 45 多次特邀演讲, 编辑了 2 部会议论文集, 在 Google Scholar 上的引用次数超过 9200 次, h 指数为 46。

## 业界工作经历

资深主任科学家 (2019.10-至今), 主任科学家 (2017.8-2019.9), 资深科学家 (2016.1-2017.7), 科学家 (2013.07-2015.12), 副科学家 (2011.8-2013.07), ABB 瑞典研发中心

创业者/联合创始人, Shanghai Shengyue Electronics Tech Co. Ltd. (China, 2007.7-2008.7), and Ambigua Medito AB (Sweden, 2008.8-2009.9)

部门主管 (2004-2007.07), 项目主管/产品经理 (2003-2004), 芯片设计工程师 (2002.07-2003), 杭州国芯科技股份有限公司

## 教育经历

PhD (电子与计算机系统), KTH 瑞典皇家工学院, 斯德哥尔摩, 瑞典, 2010.05-2013.7

MBA for PhD (创新与增长), 图尔库大学, 图尔库, 芬兰, 2009.10-2012.10

中欧经理人交流培训项目 (METP), 学习工商管理课程, 分别在中欧国际商学院(上海, 中国), 曼彻斯特城市大学 (曼彻斯特, 英国), 巴黎欧洲高等商学院 (巴黎, 法国), 和布鲁塞尔自由大学索尔维经济与管理学院(布鲁塞尔, 比利时), 2010.5 -2010.10,

B.Eng (电子工程), 浙江大学, 杭州, 中国, 1998.9-2002.6

## 学术职务

### 学校任职

[U13] 双聘教授 (工业无线通信), 智能系统系, KTH 瑞典皇家工学院, 斯德哥尔摩, 瑞典, 2021.1-至今

[U12] 博士生工业导师, 纳瓦拉大学, 西班牙, 2023.10-至今

[U10] 博士生工业导师, 格拉斯哥大学, 格拉斯哥, 英国, 2020.12-2024.4

[U09] 兼任教授 (工业 IoT), 电气与信息工程学院, 悉尼大学, 悉尼, 澳大利亚, 2019.2-2023.1

[U08] 兼任教授, 机械工程学院, 浙江大学, 杭州, 中国, 2019.4-2022.3

[U07] 双聘副教授, 瑞典皇家工学院, 斯德哥尔摩, 瑞典, 2018.01-2021.10

[U06] 博士生工业导师, 林雪平大学, 林雪平, 瑞典, 2019.4-2021.6

[U05] 博士生工业导师, 物理系, 斯德哥尔摩大学, 斯德哥尔摩, 瑞典, 2019.11-2020.06

[U04] 国际顾问, 工业工程系, 清华大学, 北京, 中国, 2013-2018

[U03] 博士生工业导师, 电气工程学院, 瑞典皇家工学院, 斯德哥尔摩, 瑞典, 2015-2016

[U02] 兼任教授, 北京邮电大学, 北京, 中国. 2014-2018

[U01] 博士研究生, 瑞典皇家工学院, 斯德哥尔摩, 瑞典, 2007.12-2010.05

### 学术组织任职

[A11] 技术委员会主席, IEEE IES Technical Committee on Cloud and Wireless Systems for Industrial Applications, 2025-至今

[A10] 管理委员会委员 (non-voting), IEEE Industrial Electronics Society, 2023-至今

[A09] 工业行动委员会委员, IEEE IES Industry Activities Committee, 2020-至今

[A08] 领导委员会委员, IEEE Internet of Things Technical Community (IoT-TC), 2023-2025

[A07] 技术委员会副主席, IEEE IES Technical Committee on Cloud and Wireless Systems for Industrial Applications, 2023-2024

[A06] 技术委员会联合主席, IEEE IES Technical Committee on Industrial Informatics, 2017-至今.

[A05] 技术委员会行业联络员, IEEE IES Technical Committee on Factory Automation, 2023-至今.

[A04] 创始成员, Industrial Wireless Technical Working Group (IWSTWG), National Institute of Standards and Technology (NIST), U.S. Department of Commerce, 2017-至今

[A03] 奖项委员会委员, IEEE Technical Committee on Cyber-Physical Systems, 2020-2020

[A02] 技术分委员会主席, Sub-TC on Industrial Internet of Things Services and People, IEEE IES Technical Committee on Industrial Informatics, 2015-2020,

[A01] 技术分委员会副主席, Sub-TC on Internet of Things Optimization, IEEE IES Technical Committee on Cloud and Wireless Systems for Industrial Applications, 2015-2016,

### 期刊任职

[AE06] 副主编, IEEE Transactions on Sustainable Computing, 2024-至今

[AE05] 副主编, IEEE Transactions on Consumer Electronics, 2024-至今

[AE04] 副主编, IEEE Internet of Things Magazine (IoTM), 2024-至今.

[AE03] 副主编, IEEE Journal of Emerging and Selected Topics in Industrial Electronics (JESTIE), 2019-至今.

[AE02] 副主编, IEEE Journal of Biomedical and Health Informatics (JBHI), 2017-至今.

[AE01] 副主编, IEEE Transactions on Industrial Informatics (TII), 2016-至今.

[GE14] 客座编辑, IEEE Journal on Selected Areas in Communications, 专刊 “Co-Design of Communication, Computing, and Control in Industrial Cyber-Physical Systems”, 2024-2025

[GE13] 客座编辑, IEEE Network, 专刊 “Cyber-Physical Security for Cloud and Fog-Hosted Industrial Cyber-Physical System”, 2024-2025

[GE12] 客座编辑, IEEE Journal of Selected Areas in Sensors (JSAS), 专刊 “Intelligent IoT for Sustainable Agriculture and Food Industries”, 2024-2025

[GE11] 客座编辑, IEEE Internet of Things Journal, 专刊 “Artificial Intelligence Integrated with Smart Sensing: Techniques, Systems, and Applications”, 2024-2025

[GE10] 客座编辑, IEEE Transaction on Consumer Electronics, 专刊 “Emerging signal processing techniques and protocols for interconnected consumer electronics in critical applications”, 2023-2024

[GE09] 客座编辑, IEEE Transaction on Consumer Electronics, 专刊 “Emerging technologies and applications of consumer electronics for healthy and sustainable life”, 2023-2024

[GE08] 客座编辑, IEEE Journal of Emerging and Selected Topics in Industrial Electronics, 专刊 “Artificial Intelligence and Low-code Technology for Customized Manufacturing Systems”, 2023-2024

[GE07] 客座编辑, IEEE Transactions on Consumer Electronics, 专刊 “Emerging Technologies and Applications of Consumer Electronics for Healthy and Sustainable Life”, 2023-2024

[GE06] 客座编辑, Proceedings of the IEEE, SI on “Real-Time Networks and Protocols for Factory Automation and Process Control Systems”, 2018-2019,

- [GE05] 客座编辑, IEEE Reviews in Biomedical Engineering (RBME), 2017-2018,
- [GE04] 客座编辑, IEEE Internet of Things Journal, SI on “Low-latency High-reliability Communications for IoT”, 2018-2019,
- [GE03] 客座编辑, IEEE Transactions on Industrial Informatics, 专刊 “Developments in Artificial Intelligence for Industrial Informatics”, 2017-2018,
- [GE02] 客座编辑, IEEE Access, SI on “Key Technologies for Smart Factory of Industry 4.0”, 2017-2018,
- [GE01] 客座编辑, Wireless Communications and Mobile Computing (Wiley and Hindawi), SI on “Time-Critical Wireless Networks for Industrial Systems and Mobile Robotics”, 2017-2018:
- [EB04] 编委, Urban Lifeline (Springer), 2023-至今,
- [EB03] 编委, Journal of Management Analytics (Taylor & Francis), 2015-2018,
- [EB02] 编委, Journal of Industrial Information Integration (Elsevier), 2015-2018,
- [EB01] 编委, International Journal of Modeling, Simulation, and Scientific Computing (WorldScientific), 2017-2018,

### 标准组织任职

- [ST06] 工作组副主席, Working Group for IEEE Std 3178: IEEE Standard for General Requirements and Protocols for Software-Defined Physical Layer of Wireless Backscatter Networks, 2022-present
- [ST05] 工作组成员, Working Group for IEEE P2805.1: Self-Management Protocols for Edge Computing Node, 2020-至今
- [ST04] 工作组成员, Working Group for IEEE P2805.2: Data acquisition, Filtering and buffering Protocols for Edge Computing Node, 2020-至今
- [ST03] 工作组成员, Working Group for IEEE P2805.3: Cloud-Edge Collaboration Protocols for Machine Learning, 2020-至今
- [ST02] 工作组成员, Working Group for IEEE P2805.4: Edge Collaboration Protocols for Federated Learning, 2023-至今
- [ST01] 工作组创始成员, Working Group for IEEE P3388 (former P1451.5p): Standard for Radio Frequency Channel Specifications for Performance Assessment of Industrial Wireless Systems, 2021-至今

### 基金评审任职

- [基金评审专家], 一个关于机器人皮肤的提案 (具体细节不公开), 欧盟研究基金 European Research Council (ERC) <http://erc.europa.eu>, 2021
- [基金评审专家], 一个关于高性能无线通信的提案 (具体细节不公开), 申请 NWA-ORC 资助, 荷兰国家研究基金 Dutch Research Council (NWO) [www.nwo.nl](http://www.nwo.nl), The Netherlands, Feb 2020
- [基金评审专家], 一个关于工业有线和无线网络的提案 (具体细节不公开), 申请国家科学技术发展基金 (FONDECYT), 智利国家研究基金 National Commission for Scientific and Technological Research of Chile (CONICYT-Chile) <https://www.conicyt.cl/>, Chili, Sep 10, 2019
- [基金评审专家] 一个关于低延迟无线通信的提案 (具体细节不公开), 申请林雪平大学工业信息技术中心 (CENIIT) 的资助, <https://liu.se/en>, Sweden, Sep 2017

### 重大项目任职

- 顾问委员会委员, 6G-SHINE ([6gshine.eu](http://6gshine.eu)), 欧盟 “地平线欧洲” 计划支持的智能网络与服务联合事业 (SNS JU) 项目, 2023-2025

### 学位答辩委员会任职

- Rijad Alisic, 博士学位论文 “Defense of Cyber-Physical Systems Against Learning-based Attackers”, KTH Royal Institute of Technology, Sweden, Nov 10, 2023
- Pedro Maia de Sant Ana, 博士学位论文 “Age-Based Metrics for Joint Control and Communication in Cyber-Physical Industrial Systems”, Aalborg University, Denmark, Aug 29, 2023
- Daniel Bujosa Mateu, 副博士学位论文 “Enabling adoption of TSN by the Industry”, at Mälardalen University (MDU), Sweden, Apr 20, 2023
- Thomas Jacobsen, 博士学位论文 “Radio Resource Management for Uplink Ultra-Reliable Low-Latency Communications”, Aalborg University, Supervisor: Professor Preben Mogensen, Aug 23, 2019

5. Weilin Zang, 博士学位论文“Research on Energy-Efficient Communication Scheme for Dynamic Characteristics of Wireless Body Area Network”, University of Chinese Academy of Sciences, Supervisor: Professor Ye Li, 2018
6. Xiaofan Mao, 博士学位论文“Research on Intelligent Detection Methods for Arrhythmia and High-performance Implementation”, University of Chinese Academy of Sciences, Supervisor: Professor Ye Li, 2018

## 学术会议 – 领导和组织

庞智博博士在国际会议中为组织会议、技术分会、研讨会、论坛、教程或专题讨论会做出了 40 次贡献，包括以下 IEEE 会议：ETFA2024(意大利)、ICIT 2024 (英国)、IES ONCON2023 (线上)、IECON2023 (新加坡)、IESES2023 (中国)、ISIE2023 (芬兰)、ICPS2023 (中国)、ICIT2023 (美国)、INDIN2023 (德国)、WFCS2023 (意大利)、IECON2022 (比利时)、BHI2022 (希腊)、ICIT2022 (中国)、ICPS2022 (英国)、WFCS2022 (意大利)、ISIE2021 (日本)、INDIN2021 (西班牙)、ICC2021 (加拿大)、BHI2021 (希腊)、Globecom2020(台湾)、INDIN2020(中国)、ETFA2019(西班牙)、ICPS2019(台湾)、INDIN2019 (芬兰)、ICII2019 (美国)、BHI2018 (美国)、INDIN2016 (法国)、ISIE2016 (美国)、ICIT2016 (台湾)、ICES2014 (2014 年 8 月, 中国上海)。

[CO42] [Industry Forum Chairs] 29<sup>th</sup> IEEE International Conference on Emerging Technologies and Factory Automation (ETFA2024), 10th-13th September 2024, Padova, Italy

[CO41] [大会共同主席] 23rd IEEE International Conference on Industrial Informatics INDIN2025, Kunming, China

[CO40] [分会场共同主席] 2024 EuCNC & 6G Summit, Antwerp, Belgium, Jun 3-6, 2024

[CO39] [产业共同主席] IEEE International Conference on Industrial Technologies (ICIT 2024), Bristol, UK, Mar 25-27, 2024

[CO38] [产业共同主席] 2nd IEEE Industrial Electronics Society Annual Online Conference (IES ONCON2023), Dec 8-11, 2023, virtual

[CO37] [展出和产业共同主席] 49th Annual Conference of the IEEE Industrial Electronics Society (IECON2023), October 16-19, 2023, Singapore

[CO36] [程序委员会] The 32nd ACM International Conference on Information and Knowledge Management (CIKM'23) hosted workshop: The 5th International Workshop on Internet of Things of Big Data for Healthcare (IoTBDH-2023), Brimingham, UK, October 21-25, 2023

[CO35] [产业共同主席] 3rd IEEE International Conference on Industrial Electronics for Sustainable Energy Systems (IESES2023), Shanghai, China, July 26-28, 2023.

[CO34] [分会场共同主席] 32nd IEEE International Symposium on Industrial Electronics (ISIE2023), Helsinki-Espoo, Finland, June 19-21, 2023

[CO33] [产业共同主席] IEEE International Conference on Industrial Cyber Physical Systems (ICPS2023), May 8-11, 2023, Wuhan, China

[CO32] [分会场共同主席 and 产业共同主席] IEEE International Conference on Industrial Technologies (ICIT 2023), Orlando, Florida, USA, Apr. 4-6, 2023

[CO31] [技术分会场共同主席] IEEE International Conference on Industrial Informatics (INDIN2023), 17th - 20th July 2023, Lemgo, Germany

[CO30] [产业共同主席] 19th IEEE International Conference on Factory Communication Systems (WFCS 2023), April 26 - 28, 2023, Pavia, Italy

[CO29] [分论坛组织者] the 48th Annual Conference of the IEEE Industrial Electronics Society (IECON2022), October 18-21, 2022, Brussels, Belgium

[CO28] [研讨会组织者] Workshop on Healthcare 4.0, the 48th Annual Conference of the IEEE Industrial Electronics Society (IECON2022), October 18-21, 2022, Brussels, Belgium

[CO27] [研讨会组织者] Workshop on Industrial Wireless Technologies and Systems, the 48th Annual Conference of the IEEE Industrial Electronics Society (IECON2022), October 18-21, 2022, Brussels, Belgium

[CO26] [会议专刊副主编] 2022 IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI), Sep. 27 - 30, 2022, Ioannina, Greece

[CO25] [工业论坛共同主席, 分会主席] 2022 IEEE International Conference on Industrial Technology (ICIT2022), online and Shanghai, China, 22-25 Aug 2022

- [CO0] [工业论坛共同主席] The 5th IEEE International Conference on Industrial Cyber-Physical Systems (ICPS2022), 24 – 26 May 2022, online and Coventry, United Kingdom.
- [CO24] [产业共同主席] 18th IEEE International Conference on Factory Communication Systems (WFCS 2022), April 27 - 29, 2022, online and Pavia, Italy
- [CO23] [工业论坛共同主席] The IEEE 30th International Symposium on Industrial Electronics (ISIE2021), held 20-23 June 2021, online and Kyoto, Japan.
- [CO22] [Tutorial 共同主席] 19th IEEE International Conference on Industrial Informatics (INDIN2021), 21-23 July 2021, Palma de Mallorca, Spain
- [CO21] [领导委员会] EAI ICMTEL 2022 - 4th EAI International Conference on Multimedia Technology and Enhanced Learning, April 15-16, 2022, Leicester, Great Britain
- [CO20] [领导委员会] EAI ICMTEL 2021 -3rd EAI International Conference on Multimedia Technology and Enhanced Learning, April 8-9, 2021, Leicester, UK (Online)
- [CO19] [研讨会组织者] Workshop on Extreme URLLC towards 6G Connectivity, The IEEE International Conference on Communications (ICC 2021), 14-23 June 2021, Virtual / Montreal, Canada
- [CO18] [产业联络共同主席] IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI'21) Jointly Organized with the IEEE-EMBS International Conference on Wearable and Implantable Body Sensor Networks (BSN'21), Athens, Greece, from 21-24 September, 2021
- [CO17] [大会共同主席] 17th IEEE International Conference on Factory Communication Systems (WFCS2021), 9 - 11 June 2021, Linz, Austria
- [CO16] [研讨会组织者] Workshop on Information Freshness, Communications, Control, and Computing for Industrial IoT, IEEE Global Communications Conference (Globecom2020), 8–10 December 2020, Taipei, Taiwan
- [CO15] [2 场分论坛的组织者] the 46th Annual Conference of the IEEE Industrial Electronics Society (IECON2020), Singapore, Oct 18-20, 2020
- [CO14] [Tutorial 共同主席, 分论坛组织者] 2020 IEEE 18th International Conference on Industrial Informatics (INDIN2020), Guangzhou, China, 11-13 July 2020
- [CO13] [特邀论坛组织者] The 1st International Conference on Industrial Artificial Intelligence (IAI2019), July 23-25, 2019 Shenyang, Liaoning, China
- [CO12] [分论坛组织者] The 24th IEEE Conference on Emerging Technologies and Factory Automation (ETFA2019), Zaragoza, Spain, September 10th - 13th, 2019
- [CO11] [4 场分论坛组织者] The 2nd IEEE International Conference on Industrial Cyber-Physical Systems (ICPS2019), Taipei, Taiwan, May 6-9, 2019
- [CO10] [产业论坛共同主席, 分论坛组织者] The IEEE International Conference on Industrial Informatics (INDIN2019), Helsinki, Finland, July 23-25, 2019
- [CO09] [论坛共同主席] The 2nd IEEE International Conference on Industrial Internet (ICII2019), Orlando, USA, Nov 11-12, 2019
- [CO08] [副主编] The IEEE Conference on Biomedical and Health Informatics (BHI) 2018, Las Vegas, Nevada, USA, 4-7 March 2018.
- [CO07] [大会共同主席] The 5th IEEE International Conference on Enterprise Systems (ES2017), Beijing, China, Sep 22-24, 2017
- [CO06] [大会主席] The International Academician Forum on Industry 4.0 and Made-in-China 2025, Yiwu, China, Sep 18-20, 2017
- [CO05] [产业联络] 17th international Conference on Computer Analysis of Images and Patterns (CAIP2017), 22-24 Aug, 2017, Ystad, Sweden
- [CO04] [大会主席] Karolinska Workshop on the Convergence of Sciences, Engineering, Medicine, and Management for Aging Health, May 22, 2017, Stockholm, Sweden
- [CO03] [Tutorial 组织者] the 14th IEEE International Conference on Industrial Informatics (INDIN2016), 18-21 July 2016, Futuroscope-Poitiers, France
- [CO02] [分论坛组织者] 2016 25th IEEE International Symposium on Industrial Electronics (ISIE2016), Jun8-10, 2016, Santa Clara, USA

[CO01] [分论坛组织者] 2016 117th IEEE International Conference on Industrial Technology (ICIT2016) , Mar14-17, 2016, Taipei, Taiwan

### 学术会议 – TPC 技术委员会成员

[TPC18] The 1st IEEE Industrial Electronics Society Annual On-Line Conference (ONCON-2022), virtual, December 9-11, 2022.

[TPC17] IEEE Global Communications Conference (GLOBECOM2019) workshop on Future wireless access for Industrial IoT (FutureIIoT), 9-13 December 2019, Waikoloa, HI, USA

[TPC16] The 11th International Symposium on UbiSafe Computing (UbiSafe 2019), Atlanta, USA, July 14-17, 2019

[TPC15] The 19th IEEE International Conference on Scalable Computing and Communications (ScalCom-2019), Leicester, UK, 19-23 August 2019.

[TPC14] The 15th International Symposium on Pervasive Systems, Algorithms and Networks (I-SPAN 2018), Yichang, China, October 16-18, 2018

[TPC13] The 16th IEEE International Conference on Smart City, (Smart City 2018), Exeter, UK, Jun 28-30, 2018

[TPC12] The 2018 IEEE International Conference on Cyber, Physical and Social Computing (CPSCom 2018), Halifax, Canada, July 30 – Aug 3, 2018

[TPC11] The 6th International Conference on Enterprise Systems (ES2018), Limassol, Cyprus, Oct 01-02, 2018

[TPC10] IEEE International Congress on Big Data, July 2-7, 2018, San Francisco, CA, USA

[TPC09] The 3rd EAI International Conference on Smart Grid and Innovative Frontiers in Telecommunications, APRIL 23–25, 2018, AUCKLAND, NEW ZEALAND

[TPC08] The 1st IEEE International Conference on Industrial Cyber-Physical Systems (ICPS 2018), Saint Petersburg, Russia, on May 15-18, 2018.

[TPC07] The 3rd International Conference on Internet of Things, Big Data, and Security (IoTBDS2018), 19-21 March, 2018, Funchal, Madeira, Portugal

[TPC06] The 3rd International Conference on Cybernetics (CYBCONF2017), Exeter, UK, 21-23Jun, 2017

[TPC05] The 2nd International Conference on Enterprise Architecture and Information Systems (E AIS 2017), July 9-13, 2017, Hamamatsu, Japan

[TPC04] International Conference on Smart Grid Inspired Future Technologies (SmartGIFT2016), May 9–20, 2016, Liverpool, Great Britain

[TPC03] International Conference on Internet of Things and Big Data (IoTBD2016), Apr23-25, 2016, Rome, Italy

[TPC02] IEEE Smart City 2015 Conference, Dec19-21, 2015, Chengdu, China

[TPC01] The 13th IEEE International Conference on Ubiquitous Computing and Communications (IUCC2014), Dec 2014, Chengdu, China

### 教职陈述

#### 总结:

庞智博博士在 KTH 开发并教授了新课程，获得了学生们的好评。他在指导硕士、博士和博士后学生方面积累了丰富的经验，要求学生具有高标准创新能力。他培训学生不仅具备理论技能，还具备实践技能，培养他们的综合创新能力。学生们通常通过发表论文、制作可行的原型，甚至申请专利来展示他们的成果。他还引导学生建立自己的研究愿景，与他们分享行业的重大趋势、前沿的工业挑战以及学术界和工业界的最先进技术的差距。他曾（共同）指导了 5 名博士后、13 名博士和 40 名硕士生。这些学生来自 10 多个国家，约 1/3 为女性。

#### 课程:

[C01] KTH, 硕士课程, EQ2461 Seminars in Information and Network Engineering, regular guest lecturer

[C01] KTH, 博士课程, FEO3290 Selected Topics on Emerging Information Technologies for Industrial Digitalization, develop and deliver half of the lectures

[C01] KTH, 硕博课程, EQ2855 Emerging Information Technologies for Industrial Digitalization, develop and

deliver half of the lectures

(联合)指导博士后:

- [PO005] Deyou Zhang, on “High accuracy positioning, security and machine learning for intelligent wireless communications”, Royal Institute of Technology (KTH), 2020.01-2023.12.
- [PO004] Yifan Gu, on “Low latency and high reliability wireless communication for industrial applications”, The University of Sydney, Australia, 2019.02-2021.06, currently Assistant Professor at Shenzhen University, China
- [PO003] Jing Yue (female), on “Distributed Fog Computing Based on Batched Sparse Codes for Industrial Control”, Royal Institute of Technology (KTH), Sweden, 2017.03-2019.02, currently Experience Researcher at Ericsson Research, Sweden
- [PO002] He Chen, on “Low latency and high reliability wireless communication for industrial applications”, The University of Sydney, Australia, 2018.01-2019.05, currently Assistant Professor at the Chinese University of Hong Kong, China.
- [PO001] Ming Zhan, on “Channel coding in high reliability and low latency wireless communication for industrial applications”, University of Electronics Science and Technology of China, China, and Royal Institute of Technology (KTH), Sweden, 2016.09-2017.08, currently Professor at the Southwest University, Chongqing, China.

(联合)指导博士生:

- [PhD15] Yichen Luo, on “Deterministic cloud and fog computing for industrial cyber physical systems and embodied intelligence”, Royal Institute of Technology (KTH), Sweden, 2024.9-2028.9 (expected)
- [PhD14] Yijia Liu, on “Cloud Fog Automation-based Open Wireless Communication for Industrial Cyber Physical Systems”, Industrial Cyber Physical Systems, Spain, and Royal Institute of Technology (KTH), Sweden, 2023.10-2027.9
- [PhD13] Le Zhang (female), on “Large Language Model for Time Series Prediction in Industrial Cyber Physical Systems”, Xi’an Jiaotong University, China, and Royal Institute of Technology (KTH), Sweden, 2023.11-2024.10
- [PhD12] Peizhou Du, on “Computational acceleration of complex motion control driven by digital twin”, Zhejiang University, China, 2023.6-2024.2
- [PhD11] Jialin Zhang (female), on “Time Critical Control over Virtualized Computing and Wireless Networks for Cloud Fog Automation”, Chinese Academy of Science, China, and Royal Institute of Technology (KTH), Sweden, 2022.10-2023.5
- [PhD10] Honghao Lyu, on “Robot control over wireless networks and edge computing”, Zhejiang University, China, and Royal Institute of Technology (KTH), Sweden, 2021.12-2022.10. He won the IES Young Professionals & Students Paper Assistance at the 48th Annual Conference of the IEEE Industrial Electronics Society (IECON2022), Oct 18-22, 2022, Brussels, Belgium
- [PhD09] Fei Pan (female), on “Physical layer security in wireless communication for industrial applications”, University of Electronics Science and Technology of China, China, and Royal Institute of Technology (KTH), Sweden, 2017.11-2018.10, currently Associate Professor at the Sichuan Agricultural University, Ya’an, China.
- [PhD08] Deep Shrestha, on “Precise clock synchronization in wireless communication for industrial applications”, Centre Tecnològic de Telecomunicacions de Catalunya, Spain, 2017.01-2017.05, currently Research Scientist at Ericsson, Barcelona, Spain.
- [PhD07] Michele Luvisotto, on “Customized physical layer in high performance wireless communication for industrial applications”, 2016-2017, University of Padova, Italy, 2016.03-2016.09, currently Research Group Manager at Hitachi-ABB Power Grids Research, Vasteras, Sweden.
- [PhD06] Jing Yue (female), on “Network coding in high performance wireless communication for industrial applications”, The University of Sydney, Australia, 2016.12-2017.02, then she continued her career as Postdoc research at Royal Institute of Technology (KTH), Sweden.
- [PhD05] Xiaolin Jiang (female), on “Wireless Communication for Critical Control: Analysis and Experimental Validation”, Royal Institute of Technology (KTH), Sweden, 2015.09-2020.05, she spent 50% of time at ABB under my daily supervision, passed PhD defense on 2020-05-29, currently Experience Researcher at Ericsson Research, Sweden.
- [PhD04] Abdul Jabbar, on “Agile intelligent beamforming antenna for industrial control”, University of Glasgow, UK, 2020.11-2024.04



[PhD03] Yu Liu, on “Enable the landing of Internet of Things: a holistic approach”, Linköping University, Sweden, 2019.04-2021.06, currently Experience Researcher at Ericsson Research, Sweden

[PhD02] Emil Hakansson, on “Quantum communication for critical industrial applications”, Stockholm University, Sweden, 2019.09-2020.03, my responsibility was handed over to another colleague then another company due to ABB’s divestment of Power Grids business.

[PhD01] Xiaolin Jiang (female), on “Wireless Communication for Critical Control: Analysis and Experimental Validation”, Royal Institute of Technology (KTH), Sweden, 2015.09-2020.05, she spent 50% of time at ABB under my daily supervision, passed PhD defense on 2020-05-29, currently Experience Researcher at Ericsson Research, Sweden.

#### 指导硕士生:

[M040] Liyuan Chen, KTH Royal Institute of Technology, “Time Critical Communication over Open Wireless Networks”, 2024.01-2024.10,

[M039] Jan Henke, Technical University of Munich, “Digital Twin-Driven Efficient Data Collection for Industrial Powertrain”, 2024.04-2024.10,

[M038] Yanghang Zeng, Aalto University, Finland, “Efficient Data Collection and Communication of Industrial Internet of Things Solutions”, 2023.05-2023.11, currently with ABB Research Sweden

[M037] Zexun Cao, University of Trento, Italy, “Cloud-Fog Automation Based Time-Critical Control: Modeling, Optimization and Task Allocation”, 2023.03-2023.10

[M036] Jing Yan (female), University of Trento, Italy, and Aalto University, Finland, ““Experimental Study and Performance Analysis of Cloud Computing Architectures for Industrial Control Systems”, 2022.02-2022.07, currently with Intel, Finland

[M035] Anna Bengtsson (female), Uppsala University, Sweden, “Latency Aware and Event-Based Wireless Control for Cloud-Fog Automation”, 2022.02-2022.06. They won the “Automation Student 2022” prize at the annual contest organized by the Automation Region, Swedish Fair, and Swedish Automation

[M034] Sofie Nilsson (female), Uppsala University, Sweden, “Latency Aware and Event-Based Wireless Control for Cloud-Fog Automation”, 2022.02-2022.06

[M033] Johannes Deivard, Mälardalen University, Sweden, “Diagnostics framework for time-critical control systems in cloud-fog automation”, 2022.01-2022.06

[M032] Valentin Johansson, Mälardalen University, Sweden, “Diagnostics framework for time-critical control systems in cloud-fog automation”, 2022.01-2022.06

[M031] Emil Lindahl, Uppsala University, Sweden, “Towards latency-aware control using 5G and Edge-based control architectures”, 2021.08-2021.12

[M030] Maxx Wallberg, Uppsala University, Sweden, “Towards latency-aware control using 5G and Edge-based control architectures”, 2021.08-2021.12

[M029] Koushik Bhimavarapu, Blekinge Institute of Technology, Sweden, “Performance Analysis and Improvement of 5G based Mission Critical Motion Control Applications” 2021.04-2021.10, currently with ABB Corporate Research, Sweden

[M028] Fangbo Shi, Royal Institute of Technology (KTH), Sweden, “Emerging wireless communication and edge computing for autonomous mobile robots”, 2021.04-2021.10

[M027] Nusrat Hossain (female), Uppsala University, Sweden, 2021.03-2021.08, currently with Ericsson, Sweden

[M026] Florian Haslhofer, Johannes Kepler Universität Linz, Austria, “Safety protocols over real-time wireless network for factory automation and mobile robotics”, 2019.08-2019.09

[M025] Marco Rossanese, University of Padova, Italy, “Real-time wireless for motion control of manipulator and mobile platform in industrial robotics”, 2019.03-2019.11

[M024] Dapeng Lan, Royal Institute of Technology (KTH), Sweden, “Experimental Study of Thread Mesh Network for Wireless Building Automation Systems”, 2016.01-2016.08, currently with Oslo University, Norway

[M023] Eva-Azoidou (female), Royal Institute of Technology (KTH), Sweden, “Modeling and Validation of Power Consumption for Battery-Operated Sensor Devices in Wireless Networks Based on the Thread Protocol”, 2016.04-2016.10, currently with Atlas Copco, Sweden

- [M022] Yu Liu, University of Trento, Italy, “Migration from Non-IP to Native-IP Building Automation Networks: Perspective of KNX and Thread”, 2016.04-2016.10, currently with Ericsson Research, Sweden
- [M021] Hui Zhu (female), Royal Institute of Technology (KTH), Sweden, “Evaluation and Research on Gaps in IoTSP Protocols for Building Automation and Smart Grid”, 2015.08-2016.02
- [M020] Binbin Xie, Royal Institute of Technology (KTH), Sweden, “Evaluation and Research on Gaps in IoTSP Protocols for Building Automation and Smart Grid”, 2015.07-2016.02, currently with JD.COM, China
- [M019] Jakob Branger, Linköping University, Sweden, “Standardization Perspectives of Communication Infrastructure for Future Buildings under the Context of IoT and Industrial4.0”, 2015.04-2015.10
- [M018] Asad Raja, Royal Institute of Technology (KTH), Sweden, “High Accuracy Location-Based Services (HiLBS) for Smart and Sustainable Buildings”, 2015.01-2015.07
- [M017] Xiaoyu Min, Aalto University, Denmark, “Low Power Wireless IP Connectivity for Smart Buildings and IoT”, 2015.01-2015.07
- [M016] Shaoling Zhu, Royal Institute of Technology (KTH), Sweden, “Low Power Wireless IP Connectivity for Smart Buildings and IoT”, 2015.01-2015.07
- [M015] Jia Wang (female), Royal Institute of Technology (KTH), Sweden, “RESTfull Web Service Based Engineering Tools for Wireless Home Automation Systems”, 2014.10-2015.04
- [M014] Yuxin Cheng, Sweden, Royal Institute of Technology (KTH), “Hybrid Communication Architecture for IP-based Wireless Home Automation Systems with Both Cloud-Based Mode and Stand-Alone Mode”, 2014.06-2014.12
- [M013] Bruno Silva, University of Pretoria, South Africa, “IR-UWB Based High Accuracy Localization Technology for Industrial Applications”, 2013.09-2014.02
- [M012] Xiaoying Sun, Royal Institute of Technology (KTH), Sweden, Development of a charging management systems for heavy-duty trucks, 2022.1-2022.6
- [M011] Gong Li, Royal Institute of Technology (KTH), Sweden, Universal sensor interface chip solution for wireless sensors, 2012
- [M010] Kang Kai. Royal Institute of Technology (KTH), Sweden, Multi-Source Energy Harvesting for Wireless Sensor Network, 2012
- [M009] Teng Wang, Royal Institute of Technology (KTH), Sweden, Water Quality Monitoring System based on WSN, 2012
- [M008] Shuxiang Xu, Royal Institute of Technology (KTH), Sweden, Protocol Implementation of WSN, 2012
- [M007] Jiahua Zhu, Royal Institute of Technology (KTH), Sweden, The Investigation for Water Quality Sensors, 2012
- [M006] Yin Hua, Royal Institute of Technology (KTH), Sweden, NFC enabled wireless sensor system, 2012
- [M005] Junzhe Tian, Royal Institute of Technology (KTH), Sweden, Prototype of user-centric ubiquitous intelligence based on open platform, 2012
- [M004] Bowei Dai, Royal Institute of Technology (KTH), Sweden, Modeling and Planning of Service-Oriented Wireless Sensor Network, 2012
- [M003] Chengxin Zhao, Royal Institute of Technology (KTH), Sweden, On-site Data Processing Algorithms and Implementation for Wireless Sensor Network, 2011
- [M002] Mohammad Tareq-Ul-Islam. Royal Institute of Technology (KTH), Sweden, Universal Sensor Interface Circuit for Wireless Sensor Network, 2011
- [M001] Xiatao Wang, Royal Institute of Technology (KTH), Sweden, Web-based RFID Tracking System Design and Implementation, 2011

## 研究陈述

### 研究成就

庞智博博士的研究专注于智能机器人和工业 4.0 及医疗 4.0 的自动化系统，应用了控制-通信-计算协同设计的跨学科方法。他的研究受到各种工业领域中关键挑战的驱动，例如医疗保健、过程自动化、建筑/家庭自动化、工厂/离散自动化、电力网、物流自动化、工业动力系统、食品和饮料等。他的研究成果总结如下。

### 1. 智能机器人感知、控制和安全交互:

- **机器人皮肤:** 与他的合作团队一起, 他开发了一种新型的仿生机器人皮肤 (CoboSkin), 用于协作机器人。CoboSkin 首次将可伸缩的触觉传感阵列、气动执行器阵列、电子显示阵列和电容传感阵列集成到一个柔性、可拉伸且易于赋形的机器人皮肤层中, 这显著提升了人机交互的安全性和情感交互, 解决了材料、器件表征、传感器与驱动器的解耦、微型化、制造、复杂布线 and 集成等方面的基础挑战。这些成果已发表在 WILEY AIS、IEEE TIE、IEEE TMRB 和 IEEE JBHI 等期刊上。
- **机器视觉和安全控制:** 与他的团队一起, 他开发了用于更安全机器人控制和更有效人机交互的 AI 驱动机器人视觉算法, 包括多视角视觉-惯性融合以实现移动机器人安全导航、相机和 IMU 联合标定、以及基于条件生成对抗网络 (cGAN) 的面部表情识别, 解决了传感器融合、高精度标定、低光照图像增强和机器学习数据扩增等方面的基础挑战。这些成果已发表在 IEEE TIM、Springer JBE、Elsevier RCIM 和 IEEE Access 等期刊上。
- **延迟感知控制和安全多机协调:** 与他的团队一起, 他开发了新型的网络硬件在环 N-HiL 仿真方法、受内模控制 (IMC) 启发的延迟感知控制, 以及车队管理系统与网络管理系统之间的互动合作, 用于在无线网络和云计算环境下安全控制移动机器人。通过在现实的网络和计算条件上重新建立其理论基础, 他的研究重新开启了无线网络控制这一多年前被认为已经关闭的研究领域。相关成果已发表在 IEEE TASE、IEEE TII 期刊上, 并获得了欧洲专利 EP4320835。

### 2. 智能机器人和自动化系统:

- **移动协作机器人系统:** 与他的团队一起, 他开发了早期的移动双臂协作机器人原型, 并采用基于手势和上肢动作混合映射的遥操作方法 TeleCobot, 专为非专业操作员设计。该原型在 COVID-19 疫情初期在隔离病房进行了测试, 这是全球最早的试验之一。该创新涉及延迟感知控制、可靠网络、安全交互、安全协调、机器人视觉和虚拟化控制器等方面, 已集成到 ABB Mobile YuMi 这一领先的工业产品中。这些成果已发表在 IEEE TMRB、IEEE JBHI、IEEE JTEHM 和 IEEE RBME 等期刊上。
- **智能自动化系统:** 与他的团队一起, 他开发了多种面向垂直行业的人工智能驱动的自动化解决方案, 例如复合碳纤维材料制造中的基于 3D 视觉的表面缺陷检测与测量、食品和饮料生产中的声学瓶缺陷检测、为老年人和声障患者的语音修复, 以及建筑气候控制系统中的异常检测与自主操作。这些成果与传统 AI 研究的一大区别是, 其与物理传感器和执行器的紧密集成以及在自动化系统中的连续运行, 大大加速了人工智能在工业实践中的应用。这些研究成果已发表在 IEEE JBHI、IEEE Access、Elsevier RCIM、Elsevier BAE 和 Elsevier JMS 上。

### 3. 网络化和虚拟化的工业控制基础设施:

- **虚拟工业和机器人控制器:** 与他的团队一起, 他首次提出了通过云计算和雾计算实现原生 AI 驱动的工业和机器人控制器的新范式 (即云/雾自动化), 不仅适用于高层工业软件, 还适用于底层时间敏感控制软件。他解决了确定性虚拟化和控制、通信与计算任务的联合协调方面的基础挑战, 并成功应用于异构控制应用中。该架构已应用于世界领先的工业产品, 如 ABB 新一代 800xA DCS 过程自动化系统和 ABB 新一代机器人控制器 OmniCore。云/雾自动化的路线图还被中国科学院应用于一个总额达百亿级的国家重大研究项目。这些成果已发表在 IEEE TII 和 IEEE IEM 期刊上。
- **工业控制系统的网络安全与功能安全:** 与他的团队一起, 他开发了基于 AI 的算法, 利用信道状态信息和无线电指纹来实现工业网络安全, 并通过应用于循环冗余校验码的随机加性噪声解码 (GRAND-CRC) 实现功能安全的联合检错与纠错。这些工作有可能重塑当今工业控制系统的功能安全底层架构, 并受到麻省理工学院 MIT 团队和瑞典最大 6G 研究中心 SweWIN Center 的关注和后续研究。这些成果已发表在 IEEE TWC、IEEE TII、IEEE IEM、IEEE CL 和 IEEE TCE 等期刊上。
- **工业控制系统的无线网络:** 与他的团队一起, 他在多种工业无线技术领域做出了重大贡献, 产生了显著的商业影响。他开发了早期用于过程自动化的 WirelessHART 协议栈, 该技术已应用于 ABB WirelessHART 产品中。他还开发了性能最高的无线光控网络 WirelessHP, 用于电力网和高压电力电子设备, 这一技术已应用于 Hitachi Energy TropOS Wireless 产品中。他提升了 Thread 协议的延迟、可靠性、能源效率和安全性, 该协议已成为建筑和家庭自动化的主流标准, 并已应用于 ABB free@home 和 ABB Welcome IP 产品中。他还建议了 5G 网络在工业控制系统中的关键性能和功能改进, 这些建议已被 3GPP 路线图采纳。在这些工作中, 他解决了延迟优化、资源分配和调度、安全性以及低功耗设计等基础挑战, 不仅通过理论模型, 还通过实际原型实现了这些解决方案。基于他的研究, 全球生产和安装了数百万件 ABB 自动化产品, 带来了超过 1 亿欧元的收入。他的工作受到英特尔、爱立信、诺基亚、博世等领先公司, 以及麻省理工学院、牛津大学、加州理工学院、加州大学欧文分校、宾夕法尼亚大学等顶尖大学的关注和后续研究。这些成果已发表在 Proceedings of IEEE、IEEE JSAC、IEEE TWC、IEEE TII、IEEE Communications、IEEE IEM 等期刊上, 并获得了 20 多项在美国、欧洲和日本的专利。

#### 4.大规模集成电路与片上系统:

- 他带领 80 多名工程师，于 2005 年开发了全球最早的单芯片 DVB-S（数字视频广播-卫星）接收器系统芯片（SoC），该芯片在全球市场上占据了重要份额，并获得了中国信息产业部颁发的“信息产业重大技术发明奖”。他还带领 10 多名工程师，于 2008 年开发了一款应用处理器 SoC，该 SoC 支持 Linux 操作系统和多标准高清视频解码（如 H.264、MPEG4、RMVB 等），用于个人多媒体播放器。此外，他在 2009 年开发了一个基于 FPGA 的片上网络（NoC）研究平台，能够实现 64 个 ARM9 CPU 核心的集成。

#### 研究成果产业化

1. [ABB Ability™ 数字化动力传动系统 - 状态监测](#): 云端工业动力传动系统实时状态监测系统。
2. [ABB 下一代分布式控制系统 DCS](#): 新一代离散控制系统，用于过程自动化，原生支持虚拟化、云/雾部署和无线网络。
3. [ABB OmniCore](#): 新一代机器人控制器，原生支持云/边缘计算和人工智能。
4. [ABB Mobile YuMi](#): 智能移动双臂协作机器人。
5. 高压直流 [HVDC](#) 电力传输解决方案的颠覆性创新（现为日立能源，前身为 ABB 电网）
6. [Tropos 无线宽带网络](#) – 用于电力网、矿业、石油与天然气以及城市基础设施中关键任务应用的高可靠性低延迟无线网络（现为日立能源，前身为 ABB 电网）
7. [ABB-free@home](#) - 建筑和家居自动化解决方案
8. [ABB Welcome IP](#) – 住宅和功能性建筑的视频通信解决方案
9. [ABB WirelessHART 仪器仪表](#) 工业过程控制解决方案
10. [国芯片上系统](#) 数字电视和消费电子产品解决方案

#### 荣誉

- [H15] Best Interdisciplinary Paper Award, 2024 IEEE Conference on Energy Internet and Energy System Integration (EI2 2024), Shenyang, China, Nov 29 - Dec 2, 2024, for the paper “Minimizing Age-of-Information for Multisystem Energy IoT System with Multiple Subsystems”, authored by Xiao Xie, Xiaoling Zhang, Fengxiao Yan, Tianjiao Bai, Zhibo Pang, and Yi Huang.
- [H14] 第 24 届 IEEE 国际通讯技术会议 (ICCT2024) 最佳论文奖, 国际电气电子工程师协会 IEEE, 2024, Best Paper Award, 2024 IEEE 24th International Conference on Communication Technology in Chengdu, China during October 18-20, 2024, for the paper “Joint Communication Bandwidth and Computing Frequency Allocation for Control-Oriented UAV-Robot Rescue Systems” authored by Daohong Shen, Xinran Fang, Wei Feng, Yunfei Chen and Zhibo Pang.
- [H13] 第 33 届国际工业电子会议 (ISIE) 青年学者和学生论文奖, 国际电气电子工程师协会 IEEE, 2024 年, 指导教师; My master student, Dongxiao Hu, won the **IES Young Professionals & Students Paper Assistance** at the 33rd International Symposium on Industrial Electronics (ISIE2024), June 18 - 21, 2024, Ulsan, South Korea, video. “Embodied AI Through Cloud-Fog Computing A Framework for Everywhere Intelligence”
- [H12] 第 16 届国际智能机器人与应用会议 (ICIRA) 最佳学生论文入围奖, 2023 年, 指导教师; My PhD student, Honghao Lyu, won the **Best Student Paper Finalist Award** in the 16th International Conference on Intelligent Robotics and Applications (ICIRA2023), Hangzhou, China, Jul, 2023.
- [H11] ABB 集团年度自动化黑客大赛二等奖, ABB 集团, 2022 年; **Runner-up Award**, ABB Process Automation Global HackSummit 2022, “Fog-hosted level-1 control”, team leader and main contributor, there were 6 Winners and 4 Runner-ups out of 62 teams, Nov 23-24, 2022.
- [H10] 瑞典自动化学生奖, 瑞典自动化行业协会, 2022 年, 指导教师; My master students, Sofie Nilsson and Anna Bengtsson, supervised by me and Alf Isaksson won the “**Automation Student 2022**” prize at the annual contest organized by the Automation Region, Swedish Fair, and Swedish Automation for their thesis on “Latency Aware and Event-Based Wireless Control for Cloud-Fog Automation”, Oct 18, 2022, Gothenburg, Sweden, News and video, the citation of the award is: “The winning entry presents a well-developed model for efficient wireless communication within the manufacturing industry. With scientifically based reasoning and practical tests, the authors contribute new knowledge that is valuable for the development of the future's cost-effective and powerful automation solutions.”
- [H09] 第 48 届国际工业电子学会年会 (IECON) 青年学者和学生论文奖, 国际电气电子工程师协会 IEEE, 2022 年, 指导教师; My PhD student, Honghao Lyu, won the **IES Young Professionals & Students Paper Assistance** at the 48th Annual Conference of the IEEE Industrial Electronics Society (IECON2022),

Oct 18-22, 2022, Brussels, Belgium, video

[H08] 年度发明人奖, ABB 集团瑞典研究院, 2021 年

[H07] 年度发明人奖, ABB 集团瑞典研究院, 2018 年

[H06] 年度发明人奖, ABB 集团瑞典研究院, 2016 年

[H05] 第 15 届国际先进通信技术会议 (ICACT) 杰出论文奖, 国际电气电子工程师协会 IEEE, 2013 年; **Outstanding Paper Award**, for “An In-home Medication Management Solution Based on Intelligent Packaging and Ubiquitous Sensing” at the 15th IEEE International Conference on Advanced Communications Technology (ICACT). Jan 2013, Pyeongchang, Korea

[H04] 北欧 RFID 大会 (RFID Nordic EXPO) 竞赛单元第一名, 2008 年; **The First Place Prize of Competition**, for “TouchMe System, a RFID Solution for Interactive Package” at the RFID Nordic EXPO 2008, Stockholm, Sweden

[H03] 浙江省科学技术奖二等奖, 中国浙江省人民政府, 2006 年, 第五完成人; **Second Level Award for Science and Technology of Zhejiang Province**, Government of Zhejiang Province, China, 2006

[H02] 新世纪 131 青年人才, 中国杭州市人民政府, 2006 年; **New Century 131 Young Talent**, Government of Hangzhou City, China, 2006

[H01] 信息产业重大技术发明奖, 中国信息产业部, 2005 年, 第四完成人; **National Significant Invention Award** (as No. 4 among the co-inventors), for the "Satellite/Cable Television Demodulator Chipsets GX1101/GX1001 ", eight projects were awarded country-wide in total, the Ministry of Information Industry of China, China, 2005

## 学术影响力排名

[R08] No.1610 out of 111935 scientists in Electrical & Electronic Engineering, “World’s Top 2% Scientists – Lifetime Scientific Influence Ranking” by Stanford University and Elsevier Data Repository, Version 6, 2023, doi: 10.17632/btchxktzyw.6

[R07] No.374 out of 111935 scientists in Electrical & Electronic Engineering, “World’s Top 2% Scientists - Annual Scientific Influence Ranking” by Stanford University and Elsevier Data Repository, Version 6, 2023, doi: 10.17632/btchxktzyw.6

[R06] World No.8079, Sweden No.66, in “the Best Scientists in the Field of Computer Science”, RESEARCH.COM, 2022 edition

[R05] No.1901 out of 106549 scientists in Electrical & Electronic Engineering, “World’s Top 2% Scientists – Lifetime Scientific Influence Ranking” by Stanford University and Elsevier Data Repository, Version 5, 2022, doi: 10.17632/btchxktzyw.5

[R04] No.345 out of 106549 scientists in Electrical & Electronic Engineering, “World’s Top 2% Scientists - Annual Scientific Influence Ranking” by Stanford University and Elsevier Data Repository, Version 5, 2022, doi: 10.17632/btchxktzyw.5

[R03] No.4052 out of 546033 scientists in Artificial Intelligence & Image Processing, “World’s Top 2% Scientists - Annual Scientific Influence Ranking” by Stanford University and Elsevier Data Repository, Version 4, 2022, doi: 10.17632/btchxktzyw.4

[R02] No.1243 out of 183648 scientists in Networking & Telecommunications, “World’s Top 2% Scientists - Annual Scientific Influence Ranking” by Stanford University and Elsevier Data Repository, Version 3, 2021, doi: 10.17632/btchxktzyw.3

[R01] No.1680 out of 161179 scientists in Networking & Telecommunications, “World’s Top 2% Scientists - Annual Scientific Influence Ranking” by Stanford University and Elsevier Data Repository, Version 2, 2020, doi: 10.17632/btchxktzyw.2

## 企业资助项目

我大部分的研究由 ABB 集团基金资助。项目细节无法在此公开文件中提供。

## 政府资助项目

[PF04] [Co-PI], “Swedish Wireless Innovation Network (SweWIN)”, funded by Vinnova (Swedish Innovation Agency) competence center project 2023-00572, 2023.11-2028.12, 27.7M SEK from Vinnova and 90M SEK total budget, Zhibo Pang as co-PI is leading the research area of “wireless functional safety” with 5M SEK from Vinnova and 10MSEK total budget.

[PF04] [PI], “Making the wireless critical control safe and resilient”, funded by Swedish Foundation for Strategic Research (SSF) project APR20-0023, 2021.05-2027.04, 1.5MSEK from SSF,

[PF03] [Senior Member (responsible for strategy, result review, and IPR)], PRJ-7646: ABB part of the H2020 project 5G SMART – 5G for smart manufacturing (<https://5gsmart.eu/>), 2019.06-2021.12, 10.2MEUR (EU in total), 500kUSD (ABB part),

[PF02] [PI], VINNOVA 2015-06548: Ultra-High Performance Wireless Communications for Industrial Applications, funded by Swedish Innovation Agency (VINNOVA), 2016.01-2017.06, 191kSEK

[PF01] [PI], VINNOVA 2017-02822: Ultra-Reliable Low Latency Wireless Communications for Industrial Digitalization, funded by Swedish Innovation Agency (VINNOVA), 2017.08-2018.01, 296kSEK,

## 国际会议特邀报告

庞智博博士在 15 多个国家的国际会议上做了 45 场以上的邀请报告，其中包括 11 场资助的主题演讲和大会发言。

他在一些 IEEE 会议上做的主题演讲或邀请报告包括：ETFA2024 (意大利), ICIEA2024 (挪威)、ICIT2024 (英国)、6G Summit 2024 (德国)、XIII BSCSE2023 (巴西)、WF-IoT2022 的研讨会 (日本)、IECON2022 (比利时)、ISIE2022 (美国)、ISIE2021 (日本)、ICC2021 的研讨会 (加拿大)、VTC2021-Spring (芬兰)、Globecom2020 (台湾)、ICC2020 的研讨会 (爱尔兰)、5G World Forum 2020 (印度)、ICII2019 (美国)、INDIN2019 (芬兰)、ISIE2019 (加拿大)、WCNC2018 (西班牙)、GLOBECOM 2017 (新加坡)、MDBS2017 (中国)、VTC2017-Spring (澳大利亚)、SAS2017 (美国)、Cybermatics2016 (中国)、ES2016 (澳大利亚)、IECON2016 (意大利)、IEEE Industry Tech Summit 2016 (美国)、INDIN2016 (法国) 以及 IEEE Smart City 2015 (中国)。

在非 IEEE 会议上，他也做了主题演讲或邀请报告，包括：ISSET 2024 (中国)、FAAI 2024 (中国)、5G-ACIA 第 27 次全体会议 2023 (瑞典)、国际工业智能峰会 2022 (中国)、FAAI 2021 (中国)、FAAI 2020 (中国)、数据创新峰会 2019 (瑞典)、AusCTW2019 (澳大利亚)、GRC-AHI2018 (香港)、ITG WSA2017 (德国)、EAI WICON2016 (中国)、SmartX2016 (中国)、国际创新城市论坛 2016 (中国) 和 LCES2013 (中国)。

[T048] [Invited Talk] “Functional Safety Communication over Deterministic Wireless Networks”, NIST Workshop on Advanced Technologies and Use Cases for High-performance Industrial Wireless Systems, September 12, 2024, online

[T047] [Invited Talk] “Functional Safety Communication over Deterministic Wireless Networks”, 29th IEEE International Conference on Emerging Technologies and Factory Automation (ETFA2024), 10th-13th September 2024, Padova, Italy

[T046] [**Funded Keynote**] “From open 5G to embodied intelligence: new progresses on the Cloud/Fog Automation”, The 2024 3rd International Symposium on Semiconductor and Electronic Technology (ISSET 2024), August 23-25, 2024 in Xi’an, China.

[T045] [**Funded Distinguished Lecture**] “From open 5G to embodied intelligence: new progresses on the Cloud/Fog Automation”, The 6th International Forum on Frontiers of Automation and Artificial Intelligence (FAAI 2024), August 21-24, 2024, Shenyang, China

[T045] [**Funded Distinguished Lecture**] “Cloud/Fog Automation: can the level-1 control be hosted in cloud computing?”, The 19th IEEE Conference on Industrial Electronics and Applications (ICIEA 2024), 05-08 August 2024, in Kristiansand, Norway

[T044] [Invited Talk] “5G/6G for industrial control systems: a new starting point”, IEEE 6G Summit Dresden 2024, May 13–14, 2024 in Dresden, Germany

[T043] [**Funded Keynote**] “Cloud/Fog Automation: the New Paradigm of Industrial Automation Calling for Cross-disciplinary Research”, at the IES Students and Yong Professionals Forum of the 25th IEEE International Conference on Industrial Technologies (ICIT2024), Mar 25-27, 2024, Bristol, UK

[T042] [**Funded Keynote**] “Communication-Computing-Control Co-Design for the Cloud Fog Automation: a New Paradigm of Realizing Industrial Automation Systems”, XIII Brazilian Symposium on Computing Systems Engineering, Nov 21-24, 2023, Porto Alegre – RS, Brazil

[T041] [**Keynote**] “5G for industrial control systems: a critical reflection”, 27th Plenary Meeting of the 5G Alliance for Connected Industries and Automation (5G-ACIA), Sep 19-21, 2023, Stockholm, Sweden

[T040] [**Keynote at Workshop**] “Time Critical IoT for Industrial Automation: the Communication and System Perspectives”, Workshop on the Internet of Time-Critical Things at the IEEE 8th World Forum on Internet of Things (WF-IoT2022), 26 October–11 November 2022, Yokohama, Japan

[T039] [Invited Speaker] “Unobtrusive evaluation of latency and reliability of industrial wireless technologies”, Workshop on Industrial Wireless Technologies and Systems at the 48th Annual Conference of the IEEE Industrial Electronics Society (IECON2022) on October 17, 2022, Brussels, Belgium.

- [T038] [Invited Speaker] “5G communication and computing for industrial control systems: where we are and directions”, Industry Forum (IF) at the 48th Annual Conference of the IEEE Industrial Electronics Society (IECON2022) on October 18 - 20, 2022, Brussels, Belgium.
- [T037] [Invited Speaker] “Impulsive noise and interference in industrial wireless systems: A perspective of non-communication sources”, 31st IEEE International Symposium on Industrial Electronics (ISIE2022), June 1-3, 2022, online and Anchorage, Alaska, USA
- [T036] [Invited Speaker] “New initiatives and challenges towards open architecture for process automation”, The 2nd International Summit on Industrial Intelligence, Jun 18-19, 2022, online and Shenyang, China
- [T035] [**Funded Distinguished Lecture**] “Cloud-Fog Automation: New trends in industrial automation powered by deterministic communication and computing”, 3rd International Forum on Frontiers of Automation and Artificial Intelligence (FAAI 2021), online and Nov 8-9,2021, in Shenyang, China
- [T034] [Invited Speaker] “New trends in communication and computing technologies towards the Cloud-Fog Automation”, the 30th IEEE International Symposium on Industrial Electronics (ISIE2021), online and Kyoto, Japan, June 20-23, 2021.
- [T033] [**Keynote at Workshop**] “WirelessHP: towards the Ethernet-grade wireless for critical control in industrial automation”, IEEE International Conference on Communications (ICC2021) Workshop on Extreme URLLC Towards 6G Connectivity, 14-23 June 2021, online and Montreal, Canada
- [T032] [Tutorial] “5G and Beyond for Robotics and Automation: Challenges and Opportunities”, The 2021 IEEE 93rd Vehicular Technology Conference (VTC2021-Spring), 25 - 28 April 2021, Helsinki, Finland
- [T031] [**Funded Distinguished Lecture**] “5G for Industrial Automation and AI: Applications and Challenges”, 2nd International Forum on Frontiers of Automation and Artificial Intelligence (FAAI 2020), October 22-23,2020, in Shenyang, China
- [T030] [Tutorial] “Ultra-Reliable and Low-Latency Communications for Industry 4.0: Industrial and Academic Perspectives”, IEEE Global Communications Conference (Globecom2020), 8–10 December 2020, Taipei, Taiwan
- [T029] [**Keynote at Workshop**] “Wireless for critical control in industrial systems: use cases, gaps, and research directions”, 2020 IEEE International Conference on Communications (ICC2020) Workshop on 5G Long Term Evolution and Intelligent Communication, Dublin, Ireland (changed to virtual), 7-11 June 2020
- [T028] [Tutorial] “High performance wireless (WirelessHP) for critical control in industrial automation”, The IEEE 5G World Forum 2020, Bangalore, India (changed to virtual), Sep 10-12, 2020
- [T027] [Panel Talk] “High Performance Wireless Connectivity for Industrial Internet”, the 2nd IEEE International Conference on Industrial Internet (ICII2019), Orlando, USA, Nov 11-12, 2019
- [T026] [Panel Talk] “Industrial Communication and Edge Computing in the Era of AI”, The IEEE International Conference on Industrial Informatics (INDIN2019), Helsinki, Finland, July 23-25, 2019
- [T025] [Invited Talk] “Last Mile Connectivity: the Bottleneck of Mission Critical Industrial IoT”, Workshop on Reliable and High Performance Wireless Systems for Factory Automation at the IEEE 28th International Symposium on Industrial Electronics (ISIE2019), Vancouver, Canada, June 13-14, 2019
- [T024] [Invited Talk] “Last Mile Connectivity for Critical Industrial IoT: to Close the Loop from Big Data to Big Value”, Data Innovation Summit 2019, Stockholm, Sweden, Mar 14-15, 2019
- [T023] [**Keynote**] “Last Mile Connectivity: the Bottleneck of Critical Industrial IoT”, The 19th Australian Communications Theory Workshop (AusCTW), Sydney, 6-8 February 2019.
- [T022] [**Funded Invited Speaker**] “Closed-Loop Sensing, Actuation and AI for Eldercare Robotics”, Gordon Research Conference on Advanced Health Informatics (GRC-AHI2018), June 17, 2018 - June 22, 2018, Hong Kong, China.
- [T021] [Panel Talk] “WirelessHP (High Performance): A New Target of Industrial Wireless for Control”, IEEE Wireless Communications and Networking Conference (WCNC2018), 15-18 April 2018, Barcelona, Spain
- [T020] [Panel Talk] “Wireless HP (High Performance): a New Target of Industrial Wireless for Control Systems”, IEEE GLOBECOM 2017, 4-8 December 2017, Singapore
- [T019] [Judge of Contest] ABB China University Innovation Contest 2018, Sep 25, 2018, Beijing, China
- [T018] [Panel Talk] Ericson Open Research Day, May 16, 2017, Stockholm, Sweden
- [T017] [**Funded Keynote**] The 11th IEEE-EMBS International Summer School and Symposium on Medical Devices and Biosensors (MDBS' 2017), Shenzhen, China, on July 07 - July 11, 2017,

- [T016] [**Keynote at Workshop**] IEEE 85th Vehicular Technology Conference: VTC2017-Spring, 4–7 June 2017, Sydney, Australia
- [T015] [Panel Talk] IEEE Sensors Applications Symposium (SAS2017), Mar 13-15, Glassboro, NJ, USA
- [T014] [Invited Plenary Speech] The 21st International ITG Workshop on Smart Antennas (WSA2017), Mar 15-17, Berlin, Germany
- [T013] [Plenary Speech] “Towards Real Time Wireless Cyber Physical Systems”, 9th EAI International Wireless Internet Conference (WICON), Haikou, China, Dec 2016
- [T012] [Plenary Speech] “Unlock the Deployment of Cyber Physical Systems by Real-Time Wireless Communications”, the 2016 World Cybermatics Congress (Cybermatics 2016) Dec. 16-19, 2016, Chengdu, China
- [T011] [Plenary Speech] “Towards Real Time Wireless Cyber Physical Systems”, The 4th International Conference on Enterprise Systems (ES2016), Melbourne, Australia / 2-3 November, 2016
- [T010] [Plenary Speech] “Replace the Optical Fiber by wireless for real-time CPS? - Industrial perspective, challenges and directions”, The 42nd Annual Conference of IEEE Industrial Electronics Society (IECON2016), October 24-27, 2016, Firenze (Florence), Italy
- [T009] [**Funded Keynote**] “Towards the Real-Time Cyber Physical Systems for Smarter Living and Production Facilities”, The 2016 International Conference on SmartX on 29-31 July 2016, in Dalian, China
- [T008] [Panel Talk] “Connectivity for future buildings towards the Internet of Things, Services and People: trends and challenges”, IEEE Industry Tech Summit, Jun 6-7, 2016, Santa Clara, USA
- [T007] [**Funded Plenary Speech**] “Industrial Internet of Things, Services, and People for Innovative Cities Driven by the Industry4.0”, 2016 International Forum on Innovative Cities, July 16-17, Shenzhen, China
- [T006] [Tutorial] “Industrial Informatics for Future Buildings and Homes”, 14th IEEE International Conference on Industrial Informatics (INDIN2016), 18-21 July 2016, Futuroscope-Poitiers, France
- [T005] [Invited Tutorial] “Industrial perspectives of future buildings under the context of internet-of-Things and Industry4.0”, IEEE Smart City 2015 Conference, Dec 2015, Chengdu, China
- [T004] [Invited Speech] “How big are the data in the era of Industrial Internet of Things (I-IoT) and Industry 4.0”, China-Northern Europe Conference on Big Data – Journal of Management Informatics special issue on Big Data Methods and Applications, Aug 3-4, 2015, Stockholm, Sweden
- [T003] [Plenary Speech] “Business-Technology Co-Design on Industrial Internet-of-Things”, IEEE Conference on Enterprise Systems (ICES2014), Aug 2014, Shanghai, China
- [T002] [Invited Speech] “Research on the Industrial Internet-of-Things for Sustainability”, Low Carbon Earth Summit(LCES2013), Sep 2013, Xi’an, China
- [T001] [Invited Lecture] “Research on the Industrial Internet-of-Things (I-IoT)”, EIT ICT Labs Summer School on Internet of Things 2014, July 2014, Stockholm, Sweden

## 学术文章列表

### 学位论文

- [D2] Zhibo Pang, “Technologies and Architectures of the Internet-of-Things (IoT) for Health and Well-being”, PhD Thesis, KTH Royal Institute of Technology, Stockholm, Sweden, 2013
- [D1] Zhibo Pang, “Business Model Design for Personal Mobile Healthcare Service: the Methodology and Case Study”, MBA Thesis, University of Turku, Turku, Finland, June 2012.

### 学术专著/会议论文集

- [B02] Hans-Peter Bernhard, and Zhibo Pang, Proceedings of the 17th IEEE International Workshop on Factory Communication Systems (WFCS 2021) - Communication in Automation, IEEE, 2021
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### 期刊论文

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[R03] Michele Luvisotto; Zhibo Pang; Roger N. Jansson, “Fast prototyping of industrial wireless communications”, ABB Review, Issue 2, 2020

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[P033] Zhibo Pang, Michele Luvisotto, Roger Jansson, “Radio-based detector and method to protect against unpredictable interference in industrial wireless communications”, International Patent PCT published as EP19156813.8, US11664922B2, Assignee: Hitachi Energy Switzerland AG, Filed 2019-02-13, Granted in US: 2023-05-30. (Core innovation: fast jamming detection by radio circuits without baseband processing).

[P032] Zhibo Pang, Xiaolin Jiang, Michele Luvisotto, Dacfe Dzong, Roger Jansson, Carlo Fischione, “Route Selection in a Wireless Communication System”, International Patent PCT published as WO-2019242943-A1, US11582675B2, Assignee: Hitachi Energy Switzerland AG, Filed: 2019-05-15, Granted in US: 2023-02-14. (Core innovation: to enable the WirelessHP-based control of critical automation systems, ultra-short latency is required, and this makes the delay spread unneglectable due to multipath effect during radio signal propagation. In some cases, two hops via the wireless channels with shorter delay spread may result in shorter latency than single hop via the channels with larger delay spread. We select the optimal links and physical layer structure and parameters e.g. the length of cyclic prefix based on the characterization of the wireless channel e.g. the delay spread. The overall method is called CCDO-- channel characterization-based delay optimization).

[P031] Zhibo Pang, Michele Luvisotto, Dacfe Dzong, “Packet detection and timing synchronization for high performance wireless communications in substation automation”, International Patent PCT published as WO-2019158181-A1, US11546199B2, Assignee: Hitachi Energy Switzerland AG, Filed: 2018-02-13, Granted in US: 2023-01-03. (Core innovation: to enable the WirelessHP-based control of substation automation systems, single OFDM symbol is applied as preamble of physical layer packet but this makes it more difficult to detect the received from the background noises and interferences by the receiver. We exploit the OFDM symbol and predict the time to start packet detection based on the available scheduling information to further reduce the probability of false alarm).

[P030] Zhibo Pang, Michele Luvisotto, Dacfe Dzong, “Frequency offset estimation and compensation for high performance wireless communications in substation automation”, International Patent PCT published as WO-2019158182-A1, US11489710B2, Assignee: Hitachi Energy Switzerland AG, Filed: 2018-02-13, Granted in US: 2022-11-01. (Core innovation: to enable the WirelessHP-based control of power grids automation systems, single OFDM symbol is applied as preamble of physical layer packet but this makes it more difficult to estimate and compensate the carrier frequency error by the receiver. We exploit the cyclic prefix of each OFDM symbol and accumulate the error extracted from multiple time slots based on the available scheduling

<sup>1</sup> Only one item is listed here if the patent application is filed or granted in multiple countries using different numbers. Some of the items are hidden as they are still in the confidential stage of the patent lifecycle.

information to further improve the accuracy of error estimation).

- [P029] Zhibo Pang, Michele Luvisotto, Xiaolin Jiang, Roger Jansson, Carlo Fischione, “Method and system of wireless TDMA scheduling for industrial machine-to-machine communication, including propagation-delay-aware scheduling”, International Patent PCT published as EP19166510.8, US11438856B2, Assignee: Hitachi Energy Switzerland AG, Filed 2019-04-01, Granted in US: 2022-09-06. (Core innovation: Method to help the scheduler in industrial networks to improve bandwidth utilization by propagation-delay-aware pipelined transmissions, by scheduling considering propagation-delay for distant nodes).
- [P028] Zhibo Pang, Michele Luvisotto, Roger Jansson, “Method and system of wireless TDMA communication for industrial machine-to-machine communication”, International Patent PCT published as EP19162695.1, US11424890B2, Assignee: Hitachi Energy Switzerland AG, Filed 2019-03-14, Granted in US: 2022-08-23. (Core innovation: Group and piggybacked acknowledgement and synchronization in industrial wireless communications. PTP-like clock sync using only beacon and uplink data, no dedicated sync packet,).
- [P027] Zhibo Pang, Michele Luvisotto, Roger Jansson, “Method for allocating resources in a wireless communication system”, International Patent PCT published as EP19158242.8, US20220110113A1, JP7279178B2, Assignee: Hitachi Energy Switzerland AG, Filed 2019-02-20, Granted in Japan: 2023-05-22. (Core innovation: packet fragmentation and aggregation by reconfiguring PHY parameters in industrial wireless communications).
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- [P025] Zhibo Pang, Michele Luvisotto, “Channel access in an industrial wireless network”, International Patent PCT published as WO-2019192683-A1, US11963216B2, EP3777434B1, Assignee: Hitachi Energy Switzerland AG, Filed: 2018-04-04, Published: 2019-11-20, Granted in EU: 2022-03-23. In US: 2024-04-16 (Core innovation: to enable the WirelessHP-based control of critical automation systems, centralized scheduling and radio resource allocation is combined with local resource allocation to efficiently utilize the channel resources for achieving ultra-short latency).
- [P024] Zhibo Pang, Xiaolin Jiang, Michele Luvisotto, Roger Jansson, Carlo Fischione, “Scheduling-transparent time-shifted duplicated network to improve availability”, International Patent PCT published as US 11,337,236 B2, EP19155673.7, Assignee: Hitachi Energy Switzerland AG, Filed 2019-02-06, Granted in US: 2022-05-17. (Core innovation: time-shifted scheduling for duplicated network).
- [P023] Zhibo Pang, Michele Luvisotto, Roger Jansson, “Method to efficiently handle low latency cyclic data inside a wireless communication node between communication interface and applications within node while maintaining data consistency and handling communication errors efficiently”, International Patent PCT published as US 11,233,624 B2, EP19155669.5, Assignee: ABB Technology Ltd, Filed 2019-02-06, Granted in US: 2022-01-25. (Core innovation: hardware MAC and software MAC interfaced by shared memory with batch processing).
- [P022] Zhibo Pang, Nan Chen, Mikael Davidsson, Michele Luvisotto, “Valve unit with wireless interface for high-voltage power electronics system”, International Patent PCT published as US 11,289,792 B2, EP 19162288.5, Assignee: ABB Technology Ltd, Filed: 2019-03-12, Granted: 2022-03-29. (Core innovation: installation of wireless antenna in HVDC valve and installation of wireless RF cell separated from HVDC hall).
- [P021] Zhibo Pang, Michele Luvisotto, “Automatic gain control in a wireless communication network for power grid control”, International Patent PCT published as WO2019158183, CN111713015 EP3753104 US 11,025,217 B2, EP2018705872, Assignee: ABB Technology Ltd, Filed: 2018-02-13, Published: 2019-10-02. Granted: 2021-06-01, (Core innovation: to enable the WirelessHP-based control of power grids automation systems, ultra-short packet is applied but this makes it more difficult to estimate the received signal strength and control the gain of analog amplifier by the receiver. We signal strength of each packet and accumulate across multiple time slots based on the available scheduling information to improve the accuracy of estimation).
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- [P019] Zhibo Pang, Dacfez Dzung, “Communications system for transmission of control signals to a power electronics module”, International Patent PCT published as WO-2018215073, US 11,075,720 B2, EP3631941 B1, Assignee: ABB Technology Ltd, Filed 2017-05-26, Granted: 2021-07-27. (Core innovation: to enable the WirelessHP-based control of high voltage power electronics systems like the HVDC power converter, beamforming is applied to tune the pattern of the radio signals between transmitter and receiver which can improve reliability and reduce the risk caused by intentional and nonintentional interferences).
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- [P014] Gargi Bag, Zhibo Pang, Morgan Johansson, “Managing communication between gateway and building automation device”, International Patent PCT published as WO 2017084718 A1, EP3378191, US11424948B2 Assignee: ABB Technology Ltd, Filed 2015-11-20, Granted: 2021-01-27. (Core innovation: reconfigure the IWSN device by the gateway through a default PHY/MAC mode so that the device can run another PHY/MAC protocol with lower cost and become future proof in building automation systems).
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- [P011] Yuqing Zhong, Zhibo Pang, “Method for showing animation effect”, Chinese Patent ZL200610098909.0, Assignee: Guoxin Science & Technology Co, Filed 2006-07-14, Granted 2009-09-16. (Core innovation: periodically change the contents of color table to dynamically map the coded/compressed graphical user interface data to actual displayed image, which enables more flexible animation effects for UI design of digital television with minimized cost.)
- [P010] Zhibo Pang, Ding Zhang, Xiaowei Huang, “Video decoding method”, Chinese Patent ZL200610098904.8, Assignee: Guoxin Science & Technology Co, Filed 2006-07-14, Granted 2008-10-01. (Core innovation: decode the B frame of MPEG video stream twice instead of once, which enables radical reduction of required memory space to 2~3 decoded image frames.)
- [P009] Zhibo Pang, Ding Zhang, Xiaowei Huang, “Method to generate the preview images”, Chinese Patent ZL200610098903.3, Assignee: Guoxin Science & Technology Co, Filed 2006-07-14, Granted 2008-08-27. (Core innovation: apply frequency domain filtering to the DCT parameters during decoding, then apply 2D smooth filtering during playback, which largely reduces complexity to generate down sampled preview image of MPEG video stream.)
- [P008] Jian Liang, Zhibo Pang, Mengyao Zhu, “Method for video and audio synchronization”, Chinese Patent ZL200610098906.7, Assignee: Guoxin Science & Technology Co, Filed 2006-07-14, Granted 2008-11-26.

(Core innovation: extra timestamps from the multiplexed MPEG audio and video streams and save them together with the demultiplexed streams respectively, then synchronize the audio and video streams based on these timestamps during decoding and playback,)

- [P007] Zhibo Pang, Bingbo Li, Xiaowei Huang, “Method to improve the SDRAM bus efficiency in video decoder”, Chinese Patent ZL200610098907.1, Assignee: Guoxin Science & Technology Co, Filed 2006-07-14, Granted 2008-12-17. (Core innovation: ping-pang operation of reading and writing SDRAM for decoding MPEG video stream, which largely increases the bandwidth efficiency of the SDRAM bus.)
- [P006] Zhibo Pang, Bingbo Li, Mingchao Ma, “Storage management method for video decoding”, Chinese Patent ZL200610098905.2, Assignee: Guoxin Science & Technology Co, Filed 2006-07-14, Granted 2008-10-22. (Core innovation: sophisticated arrangement of SDRAM memory space for decoding and playing back MPEG video stream which only requires 2~2.5 frames stored in the memory. This method radically reduces the cost of SDRAM from 32Mb to 16Mb.)
- [P005] Xiaowei Huang, Zhibo Pang, Ding Zhang, “Method to record the booting images”, Chinese Patent ZL200610098902.9, Assignee: Guoxin Science & Technology Co, Filed 2006-07-14, Granted 2008-10-22. (Core innovation: using hardware accelerator to capture an highly compressed inner frame from the MPEG2 video stream as booting image of the TV set-top-box, then play it back during the boot of the set-top-box. This method provides more user friendly design of software with minimized cost.)
- [P004] Zhijie Huang, Zhibo Pang, Ming Zhang, “Automatic channel searching method in digital Tv-set”, Chinese Patent ZL200410054279.8, Assignee: Guoxin Science & Technology Co, Filed 2004-09-03, Granted 2007-10-10. (Core innovation: use narrow band filter to scan the spectrum of receiver QAM/PSK signals, then recognize a valid TV channel is there if the spectrum meets a certain pattern, then start fast timing and carrier recovery operation until the scan of the whole band is finished. This method enables fast and blind scan/discovery of valid digital TV signals in a wide spectrum.)
- [P003] Zhibo Pang, Zhijie Huang, Ming Zhang, “Method to improve timing recovery lock detecting”, Chinese Patent ZL200410054276.4, Assignee: Guoxin Science & Technology Co, Filed 2004-09-03, Granted 2008-04-02. (Core innovation: use a FIFO structure to replace the traditional IIR filter to implement the low pass filter of the timing recovery loop of QAM/PSK signals. This method can achieve both smoothness and responsiveness of the timing recovery loop, which is important for fast signal/channel search.)
- [P002] Zhijie Huang, Zhibo Pang, Ming Zhang, “A method of timing recovery”, Chinese Patent ZL200410054277.9, Assignee: Guoxin Science & Technology Co, Filed 2004-09-03, Granted 2008-02-06. (Core innovation: select useful half-symbol and full-symbol samples from the I and Q components by applying a selectin window according to their amplitude and phase, then extract the time recovery error from the selected I/Q samples. This method can enable fast timing recovery of QAM/PSK signals with very large carrier frequency error which is important for fast signal/channel search.)
- [P001] Zhibo Pang, Zhijie Huang, Ming Zhang, “A lock detecting method in timing recovery for QAM and PSK signals”, Chinese Patent ZL200410054278.3, Assignee: Guoxin Science & Technology Co, Filed 2004-09-03, Granted 2008-04-02. (Core innovation: calculate the average radius of the half-symbol samples and full-symbol samples of the I and Q components of QAM/PSK signals, the timing recovery loop is seen as locked when the difference between these two average values is big enough. This method can largely increase the reliability and timeliness of the detection which is important for fast signal/channel search.)