

Xin Li

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BIBLIOGRAPHY

Xin is now a Ph.D. candidate at the **University of Chinese Academy of Sciences**, jointly trained with **Nanyang Technological University**, Singapore, and **ShanghaiTech University**, China. He is also with the Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences. His research advisor is **Prof. Junrui Liang** and **Prof. Yaowen Yang**. With the vision of building an Internet of Moving Things free from batteries, less polluting, and sustainable, his research focused on designing effective, reliable, and scalable battery-free IoT solutions based on kinetic energy harvesting. His research interests include **energy harvesting, intermittent computing, ubiquitous computing, and battery-free IoT system**.

EDUCATIONS

Nanyang Technological University Singapore
Ph.D. (Joint Training) in Information and Communication Engineering Sept. 2021 – Present
Research advisor: Prof. Yaowen Yang

University of Chinese Academy of Sciences Shanghai, China
Ph.D. in Information and Communication Engineering Sept. 2018 – Present
Research advisor: Prof. Junrui Liang

University of Chinese Academy of Sciences Shanghai, China
M.Sc in Information and Communication Engineering Sept. 2017 – Jul. 2018
Research advisors: Prof. Jianming Wei and Dr. Xiaoyuan Ma

North University of China Taiyuan, China
B.E. in Weapon System Engineering Sept. 2012 – Jul. 2016
Research advisor: Prof. Qiang Li

RESEARCH HONORS

- **Best Paper** of the International Conference on Vibration and Energy Harvesting Applications (VEH) in 2021.
- **Best Student Hardware Competition Finalist** of the ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS) in 2020.
- **1st Runner Up** of the IEEE Industrial Electronics Society (IES) Inter-Chapter Paper Competition in 2019.
- **1st Place** at the ACM/IEEE International Conference on Embedded Wireless Systems and Networks (EWSN) Dependability Competition – Category “Data Collection” in 2019.
- **3rd Place** at the ACM/IEEE International Conference on Embedded Wireless Systems and Networks (EWSN) Dependability Competition in 2018.

RESEARCH PROJECTS

Energy Informatization for Sustainable ICT Dec. 2021 – Present
Tsinghua University and ShanghaiTech University Shanghai, China

- Network resource allocation based on the fusion of energy flow and information flow under the condition of energy uncertainty.

KPID: a kinetic-powered IDentification system Jan. 2021 – Present
Nanyang Technological University Singapore

- Battery-free BLE mesh system.

ViPSN and ViPSN++: a vibration-powered IoT platform Jan. 2019 – Jan.2020
ShanghaiTech University Shanghai, China

- ViPSN: an open-source development platform specified for vibration-powered IoT devices.
- ViPSN-cam: a vibration-powered ubiquitous camera.
- ViPSN-gameboy: a transient-motion-powered gameboy.
- ViPSN-pluck: a transient-motion-powered motion detector.
- 1st Runner Up of the IEEE Industrial Electronics Society (IES) Inter-Chapter Paper Competition in 2019.
- Best Student Hardware Competition Finalist of the ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS) in 2020.
- Best Paper of the 3rd International Conference on Vibration and Energy Harvesting Applications (VEH) in 2021.

DeCot and DeCot++: dependable MAC protocols for IEEE 802.15.4 Mar. 2017 – Jan. 2019
Shanghai Advanced Research Institute, Chinese Academy of Sciences *Shanghai, China*

- Proposed a dependable concurrent transmission-based WSN to stand against interference.
- D-Cube: a large-scale wireless sensor network testbed.
- MoteScatter: a noise-modulation-based backscatter communication under harsh interference.
- 3rd place at the EWSN Dependability Competition in 2018.
- 1st place at the EWSN Dependability Competition – Category “Data Collection” in 2019.

RESEARCH EXPERIENCES

Assistant of Undergraduate Supervision (Prof. Junrui Liang) Jan. 2019 – Present
ShanghaiTech University *Shanghai, China*

- Mechanical backscatter tag using 2.4GHz RF signal (Yang Zhang, 2019)
- Energy harvesting insole design based on hydraulic generator (Shijie Shen, 2019)
- Design and implementation of modular intelligent IoT floor network (Ruifang Liu, 2020)
- ViPSN-Eink: a motion-powered E-ink HCI system (Yue Zhu, 2021)

Teaching Assistant of Embedded System (Prof. Junrui Liang) Mar. 2020 – Jul.2020
ShanghaiTech University *Shanghai, China*

- Assisted Prof. Liang in preparing homework solutions.
- Assisted in guiding course projects.
- Taught one lesson about battery-free IoT and ubiquitous computing.
- Q&A session.

Teaching Assistant of Computer Network (Prof. Zhice Yang) Sept. 2018 – Jan.2019
ShanghaiTech University *Shanghai, China*

- Assisted Prof. Yang in preparing homework solutions.
- Guided course projects.
- Q&A session.

Research Assistant in SeLab of CAS (Prof. Jianming Wei) Mar. 2017 – Sept. 2018
Shanghai Advanced Research Institute, Chinese Academy of Sciences *Shanghai, China*

- Built a network testbed for power-line-communication.
- Built a complete-system wireless personal area network platform.
- Participated in 973 sub-project and National Key R&D Program of China.

PUBLICATIONS

+Co-first author *Corresponding author

1. **Xin Li**, Guobiao Hu, Chaoyang Zhao, Yaowen Yang*, and Junrui Liang*, “A Paradigm Shift Battery-free Flexible Motion Sensing Solution Enabled by Triboelectric Nanogenerator and Backscatter Communication,” *Advanced Science*, under review.
2. Qiang Liu, **Xin Li**+, Hao Zhang, Jing Ren, Shuo Yang, Leitao Cao, Junrui Liang*, Shengjie Ling*, “Self-powered IntelliSense Wildfire Detection and Alarm System Composed of Sustainable, Flame Retardant, and Self-healable Hydro-ionotronic Batteries,” *Nature Communications*, under review.
3. **Xin Li**, Guobiao Hu, Yaowen Yang*, and Junrui Liang* “Dynamic Analysis of A Plucking Energy Harvester for Transient-motion-powered IoT Applications,” *IEEE/ASME Transactions on Mechatronics*, under review. (**VEH 2021 Best Paper**)

4. **Xin Li**, Guobiao Hu, Zhenkun Guo, Junlei Wang, Yaowen Yang*, and Junrui Liang*, “Frequency Up-conversion based Vibration Energy Harvesting Technology: A Review (invited paper),” *Symmetry*, 2022.
5. Jianjun Wang*, Yalei Cao, Hongjun Xiang, Zhiwei Zhang, Junrui Liang, **Xin Li**, Deyun Ding, Teng Li, Lihua Tang, “A Piezoelectric Smart Backing Ring for High-performance Power Generation Subject to Train Induced Steel-spring Fulcrum Forces,” *Energy Conversion and Management*, 2022.
6. **Xin Li**, Hong Tang, Guobiao Hu, Bao Zhao, and Junrui Liang*, “ViPSN-pluck: A Transient-motion-powered Motion Detector,” *IEEE Internet of Things Journal*, 2021.
7. **Xin Li**, Li Teng, Hong Tang, Haoyu Wang, Yu Liu, Minfan Fu, and Junrui Liang*, “ViPSN: A Vibration-powered IoT Platform,” *IEEE Internet of Things Journal*, 2021.
8. Junrui Liang*, **Xin Li**, and Hailiang Yang, “Kinetic Energy Harvesting toward Battery-free IoT: Opportunities and Challenges (invited paper),” *ZTE Communications*, 2021.
9. Guobiao Hu, Chaoyang Zhao, Yaowen Yang*, **Xin Li**, and Junrui Liang*, “Triboelectric Energy Harvesting Using An Origami-inspired Structure,” *Applied Energy*, 2021.
10. Zhenkun Guo, Guobiao Hu, Jingchao Jiang, Liuding Yu, **Xin Li**, and Junrui Liang*, “Theoretical and Experimental Study of The Vibration Dynamics of A 3D-printed Sandwich Beam with Hourglass Lattice Truss Core (invited paper),” *Frontiers in Mechanical Engineering*, 2021.
11. Jinxi Zhang, Shaobo Gong, **Xin Li**, Junrui Liang, Zhonglin Wang*, and Kailiang Ren*, “A Wind-driven Poly (tetrafluoroethylene) Electret and Polylactide Polymer-based Hybrid Nanogenerator for Self-powered Temperature Detection System,” *Advanced Sustainable Systems*, 2020.
12. Xiaoyuan Ma*, Peilin Zhang, **Xin Li**, Weisheng Tang, Jianming Wei*, and Oliver Theel, “DeCoT: A Dependable Concurrent Transmission-based Protocol for Wireless Sensor Network,” *IEEE Access*, 2018.
13. **Xin Li**, “Opportunities of Motion-powered IoT Systems,” *Proceedings of the 2021 International Conference on Embedded Wireless Systems and Networks*, Delft, Netherlands, 2021. (EWSN 2021)
14. **Xin Li**, Hong Tang, Guobiao Hu, and Junrui Liang*, “Live Demo of A Transient-motion-powered Human Motion Detector,” *Proceedings of the 2021 IEEE International Symposium on Circuits and Systems*, Daegu, Korea, 2021. (ISCAS 2021)
15. **Xin Li**, Hong Tang, Bao Zhao, and Junrui Liang*, “System Design and Implementation of A Transient-motion-powered IoT Sensor Node,” *Proceedings of the ASME 2020 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, Irvine, CA, USA, 2020. (SMASIS 2020) (**Finalist of Best Student Hardware Competition**)
16. **Xin Li**, Hong Tang, Yiyao Zhu, and Junrui Liang*, “Power Solution of A Vibration-powered Sensing Node,” *Proceedings of the 9th International Power Electronics and Motion Control Conference*, Nanjing, China, 2020. (IPEMC - ECCE Asia 2020)
17. **Xin Li**, Hong Tang, Junrui Liang*, and Lihua Tang, “Exploring The Magnetic Plucking Motion towards A Transient-motion-powered IoT Sensor Node,” *Proceedings of SPIE Conference, Active and Passive Smart Structures and Integrated Systems IX*, 2020. (SPIE SS/NDE 2020)
18. Xiaoyuan Ma, Peilin Zhang, Ye Liu, **Xin Li**, Weisheng Tang, Pei Tian, Jianming Wei, Lei Shu, and Oliver Theel, “Competition: Using DeCot+ to Collect Data under Interference,” *Proceedings of the 2019 International Conference on Embedded Wireless Systems and Networks*, Beijing, China, 2019. (EWSN 2019) (**1st place of Dependability Competition**)
19. **Xin Li**, Xiaoyuan Ma*, Peilin Zhang, Pei Tian, and Jianming Wei*, “Escape or Exploit? A Noise-modulation-based Communication under Harsh Interference,” *Proceedings of the 7th International Workshop on Real-World Embedded Wireless Systems and Networks*, in conjunction with the 16th ACM Conference on Embedded Networked Sensor Systems, Shenzhen, China, 2018. (SenSys 2018)

20. Xiaoyuan Ma*, Peilin Zhang, Weisheng Tang, **Xin Li**, Wangji He, Fuping Zhang, Jianming Wei*, and Oliver Theel, "Using Enhanced OFDCOIN to Monitor Multiple Concurrent Events under Adverse Conditions," Proceedings of the 2018 International Conference on Embedded Wireless Systems and Networks, Madrid, Spain, 2018. (EWSN 2018) (**3rd place of Dependability Competition**)

李鑫

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教育经历

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- | | |
|---|-------------------|
| 工学博士（联合培养 指导老师：Yaowen Yang 教授） <ul style="list-style-type: none">• 南洋理工大学 通信与信息系统 | 2021.09 - 现在 |
| 工学博士（指导老师：梁俊睿教授） <ul style="list-style-type: none">• 中国科学院大学/中科院上海微系统所/上海科技大学 通信与信息系统 | 2018.09 - 现在 |
| 工学硕士（指导老师：魏建明教授） <ul style="list-style-type: none">• 中国科学院大学/中科院上海高等研究院 通信与信息系统 | 2017.09 - 2018.07 |
| 工学学士（指导老师：李强教授） <ul style="list-style-type: none">• 中北大学 武器系统与发射工程 | 2012.09 - 2016.07 |

获奖经历

-
- VEH 2021 振动能量收集与应用国际会议 「最佳论文奖」
 - ASME 2020 智能材料、自适应结构与智能系统国际会议 「最佳学生硬件奖」
 - IEEE IES 2019 工业电子学会年度论文竞赛 「亚军」
 - ACM/IEEE EWSN 2019 嵌入式无线网络与系统国际会议物联网可靠通信竞赛 「冠军」
 - ACM/IEEE EWSN 2018 嵌入式无线网络与系统国际会议物联网可靠通信竞赛 「季军」

研究兴趣

-
- 动能收集技术
 - 瞬态计算
 - 泛在感知
 - 无源物联网

项目经历

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- | | |
|--|-------------------|
| 面向可持续 ICT 的信息能量深度融合机理和关键技术研究 <ul style="list-style-type: none">• 清华大学、上海科技大学和中国移动联合基金项目（国家重点研发计划）• 作为骨干成员负责基于能量流与信息流融合的 5G 网络资源协同优化的研究工作 | 2021.11 - 现在 |
| KPID 基于动能收集技术的高鲁棒无源物联网系统设计 <ul style="list-style-type: none">• 项目负责人• 负责基于动能收集技术的大规模无线通信网络协议设计 | 2021.01 - 现在 |
| ViPSN/ViPSN++ 基于动能收集技术的无源物联网开源系统设计 <ul style="list-style-type: none">• 项目负责人，负责开源系统的构建、学术推广和商业落地• 负责机-电-网三域协同设计、优化和理论分析• 负责基于功率/能量中和的无源物联网系统的实现和应用• 负责无源人机交互系统的开发 | 2019.03 - 现在 |
| IEEE 802.15.4 面向极端环境的可靠通信协议设计 <ul style="list-style-type: none">• 负责 MAC 层网络编码的实现• 负责无线传感网络测试平台的研发• 负责探索后向反散射通信技术（Backscatter Communication）在极强电磁干扰条件下的应用 | 2017.01 - 2019.01 |

工作经历

科研助理

2017.01 - 2018.09

- 中科院上海高等研究院 智能信息通信技术研究与发展中心

教学经验

助导 (本科生毕设)

2019.07 - 现在

- ViPSN-gameboy: a transient-motion-powered gameboy (Yue Zhu, 2021)
- Design and implementation of modular intelligent IoT floor network (Ruifang Liu, 2020)
- Energy harvesting insole design based on hydraulic generator (Shijie Shen, 2019)
- Mechanical backscatter tag using 2.4GHz RF signal (Yang Zhang, 2019)

助教 (本研一体化课程)

2018.09 - 2020.07

- 嵌入式系统 (EE114)
- 计算机网络 (CS120)

学术交流与服务

- 以下国际学术期刊/会议审稿人:

学术期刊: IEEE Communications Letters / Ad Hoc Networks / IET Circuits, Devices and Systems / International Journal of Power Electronics and Drive Systems / International Journal of Sustainable Energy
学术会议: ECCE Asia 2020

- 以下国际会议 TPC 成员:

ECCE Asia 2022

发表论文

+ 共同一作 * 通信作者

1. **Xin Li**, Guobiao Hu, Chaoyang Zhao, Yaowen Yang*, and Junrui Liang*, "A Paradigm Shift Battery-free Flexible Motion Sensing Solution Enabled by Triboelectric Nanogenerator and Backscatter Communication," *Advanced Science*, under review. (中科院 1 区, 影响因子: 15.44)
2. **Xin Li**, Guobiao Hu, Yaowen Yang*, and Junrui Liang* "Dynamic Analysis of A Plucking Energy Harvester for Transient-motion-powered IoT Applications," *IEEE/ASME Transactions on Mechatronics*, under review. (中科院 1 区, 影响因子: 5.67) (相关工作获得 **VEH 2021 最佳论文**)
3. Qiang Liu, **Xin Li**+, Hao Zhang, Jing Ren, Shuo Yang, Leitao Cao, Junrui Liang*, Shengjie Ling*, "Self-powered IntelliSense Wildfire Detection and Alarm System Composed of Sustainable, Flame Retardant, and Self-healable Hydro-ionotronic Batteries," *Nature Communications*, under review. (中科院 1 区, 影响因子: 14.91)
4. Jianjun Wang*, Yalei Cao, Hongjun Xiang, Zhiwei Zhang, Junrui Liang, **Xin Li**, Deyun Ding, Teng Li, Lihua Tang, "A Piezoelectric Smart Backing Ring for High-performance Power Generation Subject to Train Induced Steel-spring Fulcrum Forces," *Energy Conversion and Management*, 2022. (中科院 1 区, 影响因子: 9.70)
5. **Xin Li**, Guobiao Hu, Zhenkun Guo, Junlei Wang, Yaowen Yang*, and Junrui Liang*, "Frequency Up-Conversion based Vibration Energy Harvesting Technology: A Review," *Symmetry*, 2022. (邀稿)
6. **Xin Li**, Hong Tang, Guobiao Hu, and Junrui Liang*, "ViPSN-pluck: A Transient-Motion-Powered Human Motion Detector," *IEEE Internet of Things Journal*, 2021. (中科院 1 区, 影响因子: 9.93)
7. **Xin Li**, Li Teng, Hong Tang, Haoyu Wang, Yu Liu, Minfan Fu, and Junrui Liang*, "ViPSN: A Vibration-powered IoT Platform," *IEEE Internet of Things Journal*, 2021. (中科院 1 区, 影响因子: 9.93) (相关工作获得 **IEEE IES 2019 年度论文竞赛 亚军**)
8. Junrui Liang*, **Xin Li**, and Hailiang Yang, "Kinetic Energy Harvesting toward Battery-free IoT: Opportunities and Challenges," *ZTE Communications*, 2021. (邀稿)
9. Guobiao Hu, Chaoyang Zhao, Yaowen Yang*, **Xin Li**, and Junrui Liang*, "Triboelectric Energy Harvesting Using An Origami-inspired Structure," *Applied Energy*, 2021. (中科院 1 区, 影响因子: 9.74)
10. Zhenkun Guo, Guobiao Hu, Jingchao Jiang, Liuding Yu, **Xin Li**, and Junrui Liang*, "Theoretical and Experimental Study of The Vibration Dynamics of A 3D-printed Sandwich Beam with Hourglass Lattice Truss

Core,” *Frontiers in Mechanical Engineering*, 2021. (邀稿)

11. Jinxi Zhang, Shaobo Gong, **Xin Li**, Junrui Liang, **Zhonglin Wang***, and Kailiang Ren*, “A Wind Driven Poly (tetrafluoroethylene) Electret and Polylactide Polymer Based Hybrid Nanogenerator for Self Powered Temperature Detection System,” *Advanced Sustainable Systems*, Dec. 2020.
12. Xiaoyuan Ma*, Peilin Zhang, **Xin Li**, Weisheng Tang, Jianming Wei*, and Oliver Theel, “DeCoT: A Dependable Concurrent Transmission-based Protocol for Wireless Sensor Network,” *IEEE Access*, 2018.
13. **Xin Li**, Hong Tang, Guobiao Hu, and Junrui Liang*, “Live Demo of A Transient-Motion-Powered Human Motion Detector,” *Proceedings of the 2021 IEEE International Symposium on Circuits and Systems*, Daegu, Korea, 2021. (ISCAS 2021)
14. **Xin Li**, “Opportunities of Motion-Powered IoT Systems,” *Proceedings of the 2021 International Conference on Embedded Wireless Systems and Networks*, Delft, Netherlands, 2021. (EWSN 2021)
15. **Xin Li**, Hong Tang, Bao Zhao, and Junrui Liang*, “System Design and Implementation of A Transient-Motion-Powered IoT Sensor Node,” *Proceedings of the ASME 2020 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, Irvine, CA, USA, 2020. (SMASIS 2020) (最佳学生硬件奖 第三名)
16. **Xin Li**, Hong Tang, Yiyao Zhu, and Junrui Liang*, “Power Solution of A Vibration-Powered Sensing Node,” *Proceedings of the 9th International Power Electronics and Motion Control Conference*, Nanjing, China, 2020. (ECCE Asia 2020)
17. **Xin Li**, Hong Tang, Junrui Liang*, and Lihua Tang, “Exploring The Magnetic Plucking Motion towards A Transient-motion-powered IoT Sensor Node,” *Proceedings of SPIE Conference, Active and Passive Smart Structures and Integrated Systems IX*, 2020. (SPIE SS/NDE 2020)
18. Xiaoyuan Ma, Peilin Zhang, Ye Liu, **Xin Li**, Weisheng Tang, Pei Tian, Jianming Wei, Lei Shu, and Oliver Theel, “Using DeCot+ to Collect Data under Interference,” *Proceedings of the 2019 International Conference on Embedded Wireless Systems and Networks*, Beijing, China, 2019. (EWSN 2019) (EWSN 2019 物联网可靠通信竞赛 冠军)
19. **Xin Li**, Xiaoyuan Ma*, Peilin Zhang, Pei Tian, and Jianming Wei*, “Escape or Exploit? A Noise-modulation-based Communication under Harsh Interference,” *Proceedings of the 7th International Workshop on Real-World Embedded Wireless Systems and Networks*, in conjunction with the 16th ACM Conference on Embedded Networked Sensor Systems, Shenzhen, China, 2018. (SenSys 2018)
20. Xiaoyuan Ma*, Peilin Zhang, Weisheng Tang, **Xin Li**, Wangji He, Fuping Zhang, Jianming Wei*, and Oliver Theel, “Using Enhanced OFDCOIN to Monitor Multiple Concurrent Events under Adverse Conditions,” *Proceedings of the 2018 International Conference on Embedded Wireless Systems and Networks*, Madrid, Spain, 2018. (EWSN 2018) (EWSN 2018 物联网可靠通信竞赛 季军)