

## Dr. Junrui LIANG (梁俊睿)

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### Educations

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- Ph.D. in Mechanical and Automation Engineering* (Advisor: Prof. Wei-Hsin Liao)  
Department of Mechanical and Automation Engineering Aug. 2007 – Sep. 2010  
The Chinese University of Hong Kong Hong Kong
- M.S. in Precision Instrument and Machinery* (Advisor: Prof. Chunyu Zhao)  
School of Electronics, Information and Electrical Engineering Sep. 2004 – Mar. 2007  
Shanghai Jiao Tong University Shanghai, China
- B.S. in Instrumentation Engineering* (Advisor: Prof. Cai Ping)  
School of Electronics, Information and Electrical Engineering Sep. 2000 – Jul. 2004  
Shanghai Jiao Tong University Shanghai, China

### Working Experiences

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- Assistant Professor*  
School of Information Science and Technology Nov. 2013 – present  
ShanghaiTech University Shanghai, China
- Visiting Scholar* (Host faculty member: Prof. Seth R. Sanders)  
Department of Electrical Engineering and Computer Sciences Jul. 2015 – Jan. 2016  
University of California, Berkeley California, USA
- Visiting Scholar* (Host faculty member: Prof. Wei-Hsin Liao)  
Department of Mechanical and Automation Engineering Jun. 2015 – Jul. 2015  
The Chinese University of Hong Kong Hong Kong
- Postdoctoral Researcher* (Advisor: Prof. Henry S.-H. Chung)  
Centre for Smart Energy Conversion and Utilization Research Jan. 2013 – Oct. 2013  
City University of Hong Kong Hong Kong
- Postdoctoral Researcher* (Advisor: Prof. Wei-Hsin Liao)  
Department of Mechanical and Automation Engineering Oct. 2010 – Dec. 2012  
The Chinese University of Hong Kong Hong Kong

### Teaching Experiences

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- Instructor*
- Industrial Survey (undergraduate) Summer 2016 @ ShanghaiTech
- Renewable Energy Systems (graduate) Spring 2016, Fall 2016 & Spring 2015 @ ShanghaiTech
- Introduction to Information Science and Technology (undergraduate, co-instructor)  
Spring 2015 @ ShanghaiTech
- Analog Integrated Circuits (graduate) Spring 2014 & Fall 2014 @ ShanghaiTech
- Technical Writing in English (graduate, co-instructor) Fall 2013 @ ShanghaiTech

### *Teaching Assistant*

Engineering Profession (undergraduate)	Fall 2009 @ CUHK
Smart Materials and Structures (graduate)	Spring 2009 @ CUHK
Introduction to Control Systems (undergraduate)	Fall 2008 @ CUHK
Manufacturing Technology (undergraduate)	Spring 2008 @ CUHK
Introduction to Control Systems (undergraduate)	Fall 2007 @ CUHK

### **Honors and Awards**

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- Postgraduate Research Output Award 2010, The Chinese University of Hong Kong Dec. 2011  
(only one postgraduate student, who produced the best research output within every past year, might be nominated by the Dean of each Faculty)
- Best Information Paper Award, 2010 IEEE International Conference on Information and Automation Jun. 2010
- Best Paper Award in Automation, 2009 IEEE International Conference on Information and Automation Jun. 2009
- Best Student Contributions Award, the 19th International Conference on Adaptive Structures and Technologies Dec. 2008
- Honor for the 9th Shanghai 21st Century Mechatronic Final Year Project Contest May 2004
- Excellent Student Award, Shanghai Jiao Tong University Nov. 2003
- Second Prize in Shanghai Region, 2003 National Electronic Design Contest Nov. 2003
- Academic Scholarship 2003, Shanghai Jiao Tong University Sep. 2003
- Excellent League Member, Shanghai Jiao Tong University May 2002

### **Research Interests**

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- *Energy conversion and power conditioning circuits*: Efficient energy conversions from one form to another within the electrical domain or across different physical domains, e.g., electrical, mechanical, thermal, and their implementations with power conditioning electronics. Development on the efficient algorithm for the simulation, evaluation, and optimization of power conversion circuits and systems.
- *Kinetic energy harvesting & vibration suppression*: Theories and practical implementations about how to better capture, store, and utilize the energy from ambient kinetic sources, such as human motions and vibrations, as well as the reactive impact of energy harvesting on kinetic sources.
- *Mechatronics*: Design and control of mechatronic systems, robotics, and embedded systems.
- *Piezoelectric devices*: Design and analysis of different types of sensors, actuators, and generators using piezoelectric materials.
- *Renewable energy*: Theoretical understanding on the physical insights of different renewable energy. Practical implementations for better exploitation, transmission, and utilization of renewable energy.

### **List of Publications**

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### Journal Papers

- J14 Liya Zhao, Lihua Tang, Junrui Liang, and Yaowen Yang\*, “Synergy of wind energy harvesting and synchronized switch harvesting interface circuit,” *IEEE/ASME Transactions on Mechatronics*, in press.
- J13 Junrui Liang\*, “Synchronized bias-flip interface circuits for piezoelectric energy harvesting enhancement: a general model and prospects,” *Journal of Intelligent Material Systems and Structures*, published online before print, April 26, 2016, doi: 10.1177/1045389X16642535.
- J12 Haili Liu, Junrui Liang\*, and Cong Ge, “A mechatronic power boosting design for piezoelectric generators,” *Applied Physics Letters*, vol. 107, no. 14, art. no. 141902, 2015.
- J11 Junrui Liang\*, Henry Shu-Hung Chung, and Wei-Hsin Liao, “Dielectric loss against piezoelectric power harvesting,” *Smart materials and Structures*, vol. 23, no. 9, art. no. 092001, 2014.
- J10 Junrui Liang and Wei-Hsin Liao\*, “Impedance modeling and analysis for piezoelectric energy harvesting systems,” *IEEE/ASME Transactions on Mechatronics*, vol. 17, no. 6, pp. 1145-1157, 2012.
- J09 Junrui Liang and Wei-Hsin Liao\*, “Improved design and analysis of self-powered synchronized switch interface circuit for piezoelectric energy harvesting systems,” *IEEE Transactions on Industrial Electronics*, vol. 59, no. 4, pp. 1950–1960, 2012.
- J08 Junrui Liang and Wei-Hsin Liao\*, “Impedance network for power optimization in piezoelectric energy harvesting systems,” *HKIE Transactions*, vol. 18, no. 4, Dec. 2011. (Shortlisted paper for the *HKIE Outstanding Paper Award for Young Engineers/Researchers 2011*)
- J07 Junrui Liang\* and Wei-Hsin Liao, “Steady-state simulation and optimization of class-E power amplifiers with extended impedance method,” *IEEE Transactions on Circuit and System I: Regular Papers*, vol. 58, no. 6, pp. 1433–1445, 2012.
- J06 Junrui Liang and Wei-Hsin Liao\*, “On the influence of transducer internal loss in piezoelectric energy harvesting with SSHI interface,” *Journal of Intelligent Material Systems and Structures*, vol. 22, no. 5, pp. 503–512, 2011.
- J05 Tianliang Yang, Junrui Liang, Chunyu Zhao, and Dayue Chen\*, “Analysis and design of Class-E power amplifiers at any duty ratio in frequency domain,” *Analog Integrated Circuits and Signal*, vol. 67, no. 2, pp. 149–156, 2011.
- J04 Junrui Liang and Wei-Hsin Liao\*, “Energy flow in piezoelectric energy harvesting systems,” *Smart Materials and Structures*, vol. 20, no. 1, art. no. 015005 (11 pages), 2011. (One of the top 20 most cited articles published by *Smart Materials and Structures* in 2011)
- J03 Junrui Liang and Wei-Hsin Liao\*, “Piezoelectric energy harvesting and dissipation on structural damping,” *Journal of Intelligent Material Systems and Structures*, vol. 20, no. 5, pp. 515–527, 2009.
- J02 Yulong Zhu, Junrui Liang, Haoran Bi, and Ping Cai\*, “The design and development of teaching apparatus for correlation velocity measurement technique,” *Experiment Science and Technology* (in Chinese), no. 11, pp. 17–18, 2007.
- J01 Junrui Liang and Chunyu Zhao\*, “A design of transcutaneous power link circuit,” *Application of Electronic Technique* (in Chinese), no. 4, pp. 87–89, 2007.

### Manuscripts in review or preparation

- M03 Junrui Liang\*, “Steady-state simulation and optimization of class-E power amplifiers with extended impedance method considering MOSFET parasitics,” *IEEE Transactions on Circuits and Systems I: Regular Papers*, in preparation.
- M02 Cong Ge, Haili Liu, and Junrui Liang\*, “A comparative study on the self-powered electronic and mechatronic synchronized switch interface designs for piezoelectric energy harvesting systems,” *IEEE/ASME Transactions on Mechatronics*, in preparation.
- M01 Yuheng Zhao and Junrui Liang\*, “Synchronized triple bias-flip interface circuit for piezoelectric energy harvesting enhancement,” *IEEE Transactions on Power Electronics*, in preparation.

Conference Papers

- C17 Yuheng Zhao, Junrui Liang\*, "Synchronized triple bias-flip circuit for piezoelectric energy harvesting enhancement: operation principle and experimental validation," *2016 IEEE Energy Conversion Congress and Exposition*, Milwaukee, USA. (ECCE 2016)
- C16 Junrui Liang\*, "Design of class-E power amplifier with nonlinear components by using extended impedance method," *2016 IEEE International Symposium on Circuits and Systems*, pp. 437-440, Montreal, Canada, 2016. (ISCAS 2016)
- C15 Haili Liu, Cong Ge, Junrui Liang\*, "A comparative study on the self-powered mechatronic and electronic synchronized switch interfaces for piezoelectric energy harvesting systems," *Proc. SPIE 9799, Active and Passive Smart Structures and Integrated Systems 2016*, 97991Q, Las Vegas, USA, 2016. (SPIE SS/NDE 2016)
- C14 Yuheng Zhao, Chenbin Zhou, and Junrui Liang\*, "Implementation of synchronized triple bias-flip interface circuit towards higher piezoelectric energy harvesting capability," *Proceedings of the 26th International Conference on Adaptive Structures and Technologies*, Kobe, Japan, 2015. (ICAST 2015)
- C13 Haili Liu, Cong Ge, Junrui Liang\*, "A mechanical solution of self-powered SSHI interface for piezoelectric energy harvesting systems," *Proc. SPIE 9431, Active and Passive Smart Structures and Integrated Systems 2015*, 94310E, San Diego, USA. (SPIE SS/NDE 2015)
- C12 Liya Zhao, Junrui Liang, Lihua Tang\*, Yaowen Yang, and Haili Liu, "Enhancement of galloping-based wind energy harvesting by synchronized switching interface circuits," *Proc. SPIE 9431, Active and Passive Smart Structures and Integrated Systems 2015*, 94311G, San Diego, USA. (SPIE SS/NDE 2015)
- C11 Haili Liu and Junrui Liang\*, "Design of a class-E inverter for piezoelectric ultrasound generation against load variation," *Proceedings of 2014 Symposium on Piezoelectricity, Acoustic Waves, and Device Applications*, pp. 118-121, Beijing, China, 2014. (SPAWDA 2014)
- C10 Junrui Liang\*, "Synchronized triple bias-flips harvesting circuit: a new solution for piezoelectric energy harvesting enhancement," *Proceedings of the 25th International Conference on Adaptive Structures and Technologies*, The Hague, The Netherland, 2014. (ICAST 2014)
- C09 Junrui Liang\*, Shuo Shi, and Wei-Hsin Liao, "On the counteractive effect of dielectric loss in piezoelectric energy harvesting," *Proc. SPIE 9057, Active and Passive Smart Structures and Integrated Systems 2014*, 90571F, San Diego, USA. (SPIE SS/NDE 2014)
- C08 Junrui Liang\* and Henry Shu-Hung Chung, "Best voltage bias-flipping strategy towards maximum piezoelectric power generation," *Journal of Physics: Conference Series*, vol. 476, p. 012025, London, UK, 2013. (PowerMEMS 2013)
- C07 Junrui Liang and Wei-Hsin Liao\*, "Impedance analysis for piezoelectric energy harvesting devices under displacement and force excitations," *Proceedings of 2010 IEEE International Conference on Information and Automation*, pp. 42–47, Harbin, China, 2010. (ICIA 2010) (*Best Information Paper Award*)
- C06 Junrui Liang and Wei-Hsin Liao\*, "Impedance matching for improving piezoelectric energy harvesting systems," *Proc. SPIE 7643, Active and Passive Smart Structures and Integrated Systems 2010*, 76430K, San Diego, USA, (SPIE SS/NDE 2010) (**One of the most frequently downloaded papers from the SPIE Digital Library, as of 9 Sep. 2010**)
- C05 Junrui Liang and Wei-Hsin Liao\*, "On the influence of dielectric loss in piezoelectric energy harvesting with SSHI interface," *Proceedings of the 20th International Conference on Adaptive Structures and Technologies*, pp. 872–883, Hong Kong, 2009. (ICAST 2009)

- C04 Junrui Liang and Wei-Hsin Liao\*, “An improved self-powered switching interface for piezoelectric energy harvesting,” *Proceedings of 2009 IEEE International Conference on Information and Automation*, pp. 945–950, Zhuhai/Macau, China, 2009. (ICIA 2009)  
*(Best Paper Award in Automation)*
- C03 Junrui Liang\* and Wei-Hsin Liao, “Simulation and optimization of class-E power amplifiers with extended impedance method,” *Proceedings of 2009 IEEE International Symposium on Circuits and Systems*, pp. 2493–2496, Taipei, Taiwan, 2009. (ISCAS 2009)
- C02 Junrui Liang and Wei-Hsin Liao\*, “On the energy flow in piezoelectric energy harvesting with SSHI interface,” *Proceedings of the 19<sup>th</sup> International Conference on Adaptive Structures and Technologies*, 11 pages, Ascona, Switzerland, 2008. (ICAST 2008)  
*(Best Student Contributions Award)*
- C01 Junrui Liang and Wei-Hsin Liao\*, “Energy harvesting and dissipation with piezoelectric materials,” *Proceedings of 2008 IEEE International Conference on Information and Automation*, pp. 446–451, Zhangjiajie, China, 2008. (ICIA 2008)

## Patents

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- Junrui Liang, Yuheng Zhao, “Synchronized multiple bias-flip circuit for kinetic energy harvesting,” China Patent, in application.
- Junrui Liang, Haili Liu, Cong Ge, “A mechanical displacement extremes detecting switch and its application in vibration energy harvesting,” China Patent, in application.

## Seminar Talks

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- School of Electronics and Information Technology  
Sun Yat-Sen University Jul. 04, 2016
- University of Michigan - Shanghai Jiao Tong University Joint Institute Apr. 25, 2016
- Department of Electrical Engineering and Computer Science  
University of California, Berkeley Dec. 08, 2015
- Department of Mechanical Engineering  
University of Connecticut, CT, USA Nov. 12, 2015
- Department of Mechanical Engineering  
Stony Brook University, NY, USA Nov. 10, 2015
- School of Instrument Science and Opto-electronics Engineering  
Hefei University of Technology Dec. 26, 2014
- Department of Precision Machinery and Precision Instrumentation  
University of Science and Technology of China Dec. 26, 2014
- Department of Mechanical and Automation Engineering  
The Chinese University of Hong Kong, Hong Kong Aug. 12, 2014
- Department of Instrument Science and Engineering  
Shanghai Jiao Tong University, Shanghai, China May 23, 2014
- State key laboratory of mechanics and control of mechanical structures  
Nanjing Aeronautics and Astronautics University, Nanjing, China April 22, 2014
- Open Day Seminar, ShanghaiTech University April 07, 2014
- Seminar Series, School of Information Science and Technology  
ShanghaiTech University Mar. 04, 2014

## Research Grants

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ShanghaiTech University

- *Faculty Start-up Funding*, supporting the research entitled “Hybrid vibration energy harvesting system: holistic modeling and optimization” from 2013/11 to 2016/10, CNY 2,000,000.

National Natural Science Foundation of China

- *Young Scientists Fund* supporting the research entitled “A study on the maximum harvesting capability of piezoelectric energy harvesting circuit, from 2015/01 to 2017/12, CNY 270,000.

## Research Team / Student Supervision

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*Graduate students*

2014: Cong GE, Chenbin ZHOU, Yuheng ZHAO, Junlong WANG

2015: Kang ZHAO, Chen CHEN

2016: Shuai ZHANG

*Final year project students*

2014: Cong GE

2015: Kang ZHAO (**Excellent FYP Award in Tongji University**), Haiqing DONG, Chen CHEN

*Undergraduate mentorship*

2014: Keyu YAN, Wentao LV, Junyi FENG, Haizhou FANG, Yichi ZHANG, Jianian LI

2015: Jiatong YU, Yao ZHANG, Yifei XU, Xiangchen ZENG, Jingyi HUANG

2016: Yuzhu JIN, Lu YAO, Xinchun WANG, Haoyu LIU, Ziyuan HU, Minjie SONG, Chengzhang HE

*Alumni*

Dr. Haili Liu (Postdoctoral Fellow 2014-2016)

Mr. Lijun TU (Lab Manager 2015-2016)

## School / University Services

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Member of school level committees

Academic Affairs Committee (Sept. 2014 – present)

Public Relation Committee (Sept. 2014 – Aug. 2016)

Research Management Committee (Jan. 2016 – present)

Staff Search Committee (Sept. 2016 – present)

## Professional Affiliations and Activities

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*Member of*

Institute of Electrical and Electronics Engineers (IEEE)

American Society of Mechanical Engineers (ASME)

*Reviewer of*

*Journals:* IEEE Transactions on Circuit and System I: Regular Papers / IEEE Transactions on Industrial Electronics / Electronics Letters / IEEE/ASME Transactions on Mechatronics / IEEE Transactions on Automation Science and Engineering / IEEE Transactions on Industry



Applications / IEEE Industry Applications Magazine / Applied Physics Letters / Sensors & Actuators: A. Physical / Journal of Intelligent Material Systems and Structures / Smart Materials and Structures / Journal of Micromechanics and Microengineering / Microsystems & Nanoengineering / Acta Physica Sinica (物理学报) / SCIENCE CHINA Information Sciences / Energy Conversion and Management / Recent Patents on Electrical & Electronic Engineering / Sensors (MDPI) / Micromachines (MPDI) / Latin American Journal of Solids and Structures

*Conferences:* IEEE International Symposium on Circuits and Systems (ISCAS) / IEEE Energy Conversion Congress and Exposition (ECCE) / IEEE International Conference on Control and Automation (ICCA) / Annual Conference of the IEEE Industrial Electronics Society (IECON) / IEEE International Conference on NEW Circuits and Systems (NEWCAS)

*Section Chair*

SPIE Smart Structures/NDE conference, March 2014, 2015, 2016  
International Conference on Adaptive Structures and Technologies (ICAST), October 2015

*Committee Member*

*Program Committee* of SPIE Smart Structures/NDE conference 2016, 2017  
*Technical Committee* of Power and energy circuits and systems (PECAS) in IEEE Circuits and Systems Society from 2016