Jingcheng LI [李菁澄]

PhD candidate at National University of Singapore

jingcheng@u.nus.edu | +65 80321468 | Jing Cheng | Google Scholar

Education

Aug 2020 - Sep 2024	PhD, Mechanical Engineering	National University of Singapore (Singapore)
Jan 2019 - May 2020	MS, Mechanical Engineering	National University of Singapore (Singapore)
Sep 2014 - Jun 2018	BEng, Automation	Central South University (Changsha, PRC)

Research and Project Experiences

Keywords Piezoelectrics, Smart materials, Electrospun fibers, Triboelectrics, Machine learning

PhD student Aug 2020 - present

Thesis title: Electromechanical energy conversion in piezoelectric fibers and their engineering applications
Supervisor: Prof. Seeram Ramakrishna (NUS), co-supervisor: Dr. Kui YAO (IMRE, A*STAR)
– Smart ultrasonic transducer for structural health monitoring: Developed piezoelectric transducers based on ultrasonic bulk waves with machine learning assisted methods to evaluate structural health condition.
– Fiber-based triboelectric sound absorber: Developed theoretical acoustic models for fiber-based structure utilizing triboelectric effect, and experimentally verified their significantly improved airborne sound absorption performance compared to commercially available products.
– Piezoelectric nanofibrous membrane as wearable tactile sensor: Developed a self-powered, porous, flexible, hydrophobic and breathable nanofibrous membrane based on electrospun polyvinylidene fluoride nanofiber as a tactile sensor with low-cost and simple fabrication for human body motion detection and recognition.

MS student Jan 2019 - May 2020

– Dissertation title: Performance evaluation of a FPGA system (Supervisor: Assoc. Prof. Chong Jin ONG)
Investigated the capability of FPGA systems and compared that to a conventional multi-core processor-based PC. Evaluated the performances using computational-demanding application like a neural network application.
– Other projects: Developed and implemented multiple models using various machine learning techniques, including Multi-Layer Perceptron (MLP), Radial Basis Function Network (RBFN), Self-Organizing Map (SOM), Support Vector Machine (SVM), and Reinforcement Learning, for data analysis purposes such as hand-writing recognition and classification; Control and motion planning of a six-degree-of-freedom manipulator.

Undergraduate Sep 2014 - Jun 2018

Department of Automation, School of Information Science and Engineering (Currently School of Automation)
– Final Year Project (Dissertation): Index Prediction Method for the Flotation Process Based on Big Data and Dynamic Networking (Supervisor: Prof. Xiaoli Wang).
– Other projects: Arm Cortex-M4 based smart car development for the National College Students' Smart car Competition (Supervisor: Prof. Ji Wang); Control and path planning of a hexapod robot.

Technical Skills

Experimental Skills
– Standard optical microscopy, scanning electron microscopy (SEM), X-ray diffraction analysis (XRD), Fourier transform infrared spectroscopy (FTIR), thermogravimetric analysis (TGA), ultraviolet-visible (UV-vis) spectroscopy, laser scanning vibrometry (LSV), X-ray micro-computed tomography (μCT)
– Macro- and nano-fabrication of fibers using home-built and commercial electrospinning systems
– Fabrication of direct-write piezoelectric transducers for structural health monitoring
– Common electronic and mechanical characterizations (oscilloscope, function generator, amplifier, impedance analyzer, source meter, electrometer, tensile testing, etc.)
– Acoustic impedance tube and testing systems

Programming and software skills
– Programming language: Python, MATLAB and C. Experienced in scripting for data analysis and signal pro-

cessing such as Fourier and wavelet transforms/analysis; familiar with common machine learning frameworks and techniques such as TensorFlow and PyTorch.
– Numerical simulation: COMSOL Multiphysics (for ultrasonic applications involving piezoelectric transducers), CAD softwares (Shapr3D, Solidworks), MATLAB, LabView, Multisim, Proteus.
– Illustration & Multimedia tools: Prism, Origin/Veusz, Adobe Illustrator, Adobe Photoshop, video editing.

Professional Activities

Conference assistant, ICMAT2023, Singapore June 2023
Coordinated conference oral sessions, managed presenter attendance and presentation materials, provided support to Session Chairs ensuring a seamless conference experience.

Meeting host, National University of Singapore, Singapore Jul 2022 - Dec 2022
Arranged and facilitated meetings with visitors from a range of industries, including *Mann+Hummel* and *Softmatter, MAS Holdings*. Demonstrated organizational and leadership capabilities, and ability to communicate and collaborate effectively with industries.

Teaching Assistant, National University of Singapore, Singapore Jan 2021 - Jan 2022
– ME6501 Research Topics in Material Science (Spring 2021 and Fall 2021)
– ME2121 Engineering Thermodynamics and Heat Transfer (Fall 2021)
– ME1102 Engineering Principles and Practice (Spring 2021)

Assistant Engineer, Chinalco Luoyang Copper Co. LTD, Luoyang, Henan, China Jul 2017 - Aug 2017
Provided technical support to debug equipment and machine tools, designed and improved metal processing machinery, authored operation manuals for various machine tools.

Assistant Engineer, XiangDian Group Co. LTD (XEMC), Xiangtan, Hunan, China Jul 2016 - Aug 2016
Conducted tests on instrument electronic behaviors, debugged instruments, analyzed the manufacturing process, familiarized structures and working principles of different generators and motors.

Research Publications

1. Li, J., Yousry, Y.M., Yao, K. & Ramakrishna, S. Mechanism of airborne sound absorption through triboelectric effect for noise mitigation. *Nature Communications* (Accepted) (2024).
2. Li, J., Yin, J., Wee, M. G. V., Chinnappan, A. & Ramakrishna, S. A self-powered piezoelectric nanofibrous membrane as wearable tactile sensor for human body motion monitoring and recognition. *Advanced Fiber Materials* **5**, 1417–1430 (2023).
3. Li, J., Yin, J., Ramakrishna, S. & Ji, D. Smart mask as wearable for post-pandemic personal healthcare. *Biosensors* **13**, 205 (2023).
4. Li, J. et al. Intelligent polymers, fibers and applications. *Polymers* **13**, 1427 (2021).
5. Jing, Y., Li, J., Ramakrishna, S. & Xu, L. Hybrid-structured electrospun nanofiber membranes as triboelectric nanogenerators for self-powered wearable electronics. *ACS Sustainable Chemistry & Engineering* **11**, 14020–14030 (2023).
6. Jing, Y., Li, J., Reddy, V. S. & Xu, L. Flexible textile-based sweat sensors for wearable applications. *Biosensors* **13**, 127 (2023).
7. Bai, H., Wee, M. G. V., Chinnappan, A., Li, J., Shang, R., & Ramakrishna, S. Effect of polyvinylpyrrolidone and lithium chloride composite desiccant-coated heat exchangers on dehumidification studies. *Applied Thermal Engineering* **248**, 123318 (2024).

– **Manuscript in preparation** Machine learning-assisted structural health monitoring with direct-write piezoelectric ultrasonic transducers. (2024).

Conference presentation "Health-care sensors with intelligent materials – 'sensing' for a sustainable future", World Engineering Summit (WES), Singapore (2021).