Longlong Li

PhD Student | BioMEMS / Biosensors / Engineered Cardiac Tissue Monitoring

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Comprehensive academic version for research collaboration, postdoctoral applications, and academic review.

Profile

- PhD student specializing in BioMEMS, multimodal biosensors, engineered cardiac tissue monitoring, and drug cardiotoxicity evaluation.
- Experienced in MEMS device design, microfabrication, cell and tissue culture, sensing system integration, and multimodal biosignal analysis.
- Research focuses on integrating strain sensors, microelectrode arrays, and 3D bioelectronic platforms for synchronized and quantitative assessment of cardiac tissue function.

Education

- 2022-Present | Ph.D. in Mechanical Engineering, Chonnam National University, Gwangju, South Korea
- 2018-2022 | B.Eng. in Mechanical Engineering, Wenzhou University, Wenzhou, China

Research Experience

- Designed and developed BioMEMS-based multimodal sensing platforms for engineered cardiac tissues.
- Integrated strain sensors and microelectrode arrays to monitor mechanical contraction and electrical activity in cardiac tissue models.
- Established 3D engineered heart tissue culture and drug stimulation workflows for cardiotoxicity screening and disease modeling.
- Developed MATLAB / Python-based analysis workflows for extracting contraction amplitude, beating frequency, field potential features, and electromechanical coupling parameters.
- Built experimental measurement systems involving low-noise signal acquisition, microscopy, sensor calibration, and hardware integration.

Technical Skills

- Microfabrication: Photolithography, metal deposition, SU-8 / PI processing, MEMS sensor fabrication, device packaging, sensor characterization.
- Biosensing: Strain sensors, microelectrode arrays, electromechanical monitoring, low-noise signal acquisition, sensor calibration.
- Cell & Tissue Engineering: NRVM / hiPSC-CMs culture, engineered heart tissue construction, collagen / dECM bioinks, drug stimulation experiments, immunostaining.
- Data Analysis: MATLAB, Python, cardiac signal processing, feature extraction, visualization, statistical analysis.
- System Integration: DAQ systems, amplifier circuits, microscopy, automated measurement platforms, prototype development.

Projects

- 2026.03-Present | Bioinspired Hypoxic Cardiac Model and Electromechanical Evaluation Platform, MNTL.
- 2024.03-2026.03 | High-Throughput Drug Toxicity Screening Platform Based on 3D Cardiac Tissues, MNTL.
- 2022.09-2024.03 | Graphene-Conductive Microenvironment for Cardiomyocyte Maturation and Electrophysiological Communication, MNTL.
- 2022.01-2022.08 | Smart Trash Bin Development, Cixi Zhuoshang Electric Appliance Co., Ltd.
- 2021.01-2021.12 | Desktop Customized Food 3D Printer, Wenzhou University.

- 2020.01-2020.12 | Toy Storage Robot Based on Visual Recognition and Navigation, Wenzhou University.

Publications

- Graphene SU-8 platform for enhanced cardiomyocyte maturation and intercellular communication in cardiac drug screening. ACS Nano 18(49): 33293-33309, 2024.
- Harnessing native blueprints for designing bioinks to bioprint functional cardiac tissue. iScience 28(3), 2025.
- Development of multifunctional PAA-alginate-carboxymethyl cellulose hydrogel-loaded fiber-reinforced biomimetic scaffolds for controlled release of curcumin. International Journal of Biological Macromolecules 301: 140449, 2025.
- Dual-sensitized hollow SnO2 nanospheres with rGO and Pd for highly sensitive detection of acetone in exhaled breath. Applied Surface Science 696: 162959, 2025.
- Hydrogel-Integrated Biomimetic Hydroxyapatite Scaffolds with Tunable Porosity for Enhanced Curcumin Delivery. Journal of Drug Delivery Science and Technology, 107572, 2025.
- Enhancing cardiomyocyte maturation through PEDOT:PSS-coated surfaces and mechanical stimulation with strain sensors. Journal of Micromechanics and Microengineering 35(4): 045002, 2025.
- InGaN-GaN-MQW-ZnO based e-nose sensors for nitrogen dioxide detection using advanced machine learning approaches. Sensors and Actuators B: Chemical, 138650, 2025.
- Air-Breakdown Triboelectric Nanogenerator Inspired by Transistor Architecture for Low-Force Human-Machine Interfaces. Nano-Micro Letters 18(1): 251, 2026.
- Tilted-angle acoustofluidic separation of live and dead neonatal rat ventricular myocytes using hypotonic cell swelling. Sensors and Actuators B: Chemical, 2026.

Conferences

- The hybrid cantilever of conductive graphene and SU-8 for improving the maturity and electrical coupling of cardiomyocytes. MicroTAS 2023, Katowice, Poland.
- Enhancing Cardiomyocyte Maturation via Mechanical Stimulation of 3D Printed Cardiac Tissue Using a Origami-based 3D Sensor and Magnetic Fields. IEEE NANOMED 2024, Hawaii, USA.
- Polymer Cantilever Integrated with a Full-Bridge Sensor for Continuous Wireless Measurement of Cardiomyocyte Contractility. MicroTAS 2024, Montreal, Canada.
- Monitoring of drug-impacted cardiomyocytes contractility using PI microcantilever structures with nano-silicon strain sensor. MicroTAS 2024, Montreal, Canada.
- A Dual-Detection Approach for Cardiotoxicity Screening: Utilizing Nano Silicon Strain Sensor and MEA to Monitor Contractility and Field Potential in Cardiomyocytes. IEEE MEMS 2025, Kaohsiung, Taiwan.
- Origami-Inspired 3D Sensor Platform for Real-Time Electromechanical Coupling Analysis in Engineered Heart Tissues. IEEE SENSORS 2025, Vancouver, Canada.
- Integrated Bioelectronic Platform Utilizing PEDOT:PSS Strain Sensors for Real-Time Mechanostimulation and Sensing. IEEE SENSORS 2025, Vancouver, Canada.
- Development of a Multi-Channel Wireless Monitoring Platform for Long-Term Cardiomyocyte Contraction Assessment Using a Polymer Cantilever with Integrated Sensor. MicroTAS 2025, Adelaide, Australia.
- Enhancement of cardiomyocyte microenvironment and functional assessment using through-hole structures with integrated polymer cantilevers. MicroTAS 2025, Adelaide, Australia.
- Multimodal Microelectrode-Microcantilever Array for Electromechanical Analysis of Cardiomyocyte Tissue in Drug Testing. IEEE MEMS 2026, Salzburg, Austria.

Patents

- Automatic Potato Harvester. Invention Patent Application, CN113875385A / 202111383414.3, filed 2021-11-22, published 2022-01-04.
- Vertical-Folding-Based Clothes Folding Machine. Granted Invention Patent, CN113186699B / 202110624021.0, granted 2023-02-07.

- Household Intelligent Toy Storage Robot. Granted Invention Patent, CN112407980B / 202011170715.3, granted 2022-01-18.

- Zinc Alloy Dross-Skimming Robot and Working Method. Granted Invention Patent, CN111923063B / 202010801270.8, granted 2021-07-16.

- Intelligent Launch-and-Recovery Management Device for UAV Swarms. Utility Model Patent, CN216269980U / 202123168608.X, granted 2022-04-12.

- Traction Device for Potato Harvesters. Utility Model Patent, CN216232634U / 202122864096.4, granted 2022-04-08.

- Potato-Soil Separation Device for Potato Harvesters. Utility Model Patent, CN216253977U / 202122864125.7, granted 2022-04-12.

- Potato Digging Device. Utility Model Patent, CN216313996U / 202122864112.X, granted 2022-04-19.

- Automatic Potato Harvester. Utility Model Patent, CN216415123U / 202122859852.4, granted 2022-05-03.

- Trash Bin Based on Cam-Track Bag Closing and Heat Sealing. Utility Model Patent, CN216234167U / 202122813075.X, granted 2022-04-08.

- Telescopic Rotating Arm for Folding and Rolling in a Clothes Folding Machine. Utility Model Patent, CN215163984U / 202121243359.3, granted 2021-12-14.

- Cart-Bucket Turning Mechanism for Dumping Objects. Utility Model Patent, CN213443970U / 202022431595.X, granted 2021-06-15.

- Synchronous Multi-Scissor Lifting Device for Object Lifting. Utility Model Patent, CN213446006U / 202022431602.6, granted 2021-06-15.

- Timing-Belt Toy Collection Mechanism for a Household Intelligent Toy Storage Robot. Utility Model Patent, CN213536204U / 202022431641.6, granted 2021-06-25.

- Zinc Alloy Dross-Skimming Robot. Utility Model Patent, CN212763486U / 202021656863.1, granted 2021-03-23.

Awards

- 2025 | BK21 Fellowship Scholarship

- 2025 | RLRC Outstanding Graduate Student

- 2021 | China National Scholarship

- 2019 | Zhejiang Provincial Government Scholarship