



## EDUCATION

### Southern University of Science and Technology (SUSTech)

Aug 2021 – Jul 2025

*Bachelor of Engineering in Materials Science and Engineering*

- ♦ **Overall GPA:** 3.8/4.0 | **Rank:** Top 5 in the 2025 cohort
- ♦ **Scholarship:** NEWARE Scholarship (Industry-sponsored, 2024); Second-class Scholarship (2024); Third-class Scholarship (2022); Excellent Freshman Scholarship (2021)
- ♦ **Honor:** Outstanding Graduation Project (2025)

## RESEARCH INTEREST

**Electronic skins (E-skins) for supporting observational learning in humanoid robots:** I aim to address the **cross-domain knowledge transfer of tactile intelligence** from humans to machines. To this end, I seek to develop E-skins applicable to both humans and humanoid robots, and integrate learning algorithms to achieve the transfer learning of tactile experiences from humans to robots.

## PUBLICATION & PATENT

- ♦ Z. Wu, **J. Liu**, Y. Tian, Y. Cheng, J. Ma, J. Feng. Ultra-sensitive Flexible Temperature Sensor Based on Polyionic Elastomer with a Wide Detection Range. *Proceedings of the IEEE International Conference on Electronics, Circuits and Systems (ICEPT 2025)*. (Accepted)
- ♦ Z. Wu, Y. Cheng, Z. Yang, T. Wang, **J. Liu**, J. Feng, Y. Tian, C. Guo. Ultra-Sensitive and High-Resolution Flexible Iontronic Humidity Sensor for Detecting Subtle Moisture Differences. *Advanced Functional Materials*. 2025, e17569. (In Press)
- ♦ R. Wang, Y. Cheng, Q. Zhang, H. Li, W. Wu, Y. Wang, **J. Liu**, R. Xing, J. Ma, T. Jiao. Near infrared light-based non-contact sensing system for robotics applications. *Advanced Materials*. 2025, 30, e2414481.
- ♦ S. Xie, Y. Cheng, X. Chen, **J. Liu**. A polyionic elastomer with its preparation method and an ultra-sensitive iontronic flexible temperature sensor with its application based on polyionic elastomer. Patent No. 202410734790.X. (Granted)

## MAJOR RESEARCH EXPERIENCE

### Ultra-Flexible Electronics Laboratory, SUSTech

Jan 2023 – Present

*Research Assistant (full-time), Advisor: Prof. Chuanfei Guo*

### Graduation Project: Highly Conformal and Bimodal Fingertip Electronic Skins

Sep 2024 – Jun 2025

- ♦ Developed four types of E-skins with ascending conformality to finger tips, addressing the data distortion issue caused by poor interface adhesion between E-skins and complex curved surfaces.
- ♦ Designed and integrated four modules of sensor, adapter, signal acquisition and processing, manipulator and servo control for intelligent TCM diagnosis.
- ♦ Innovated a working mechanism, designed a characteristic data acquisition method, and constructed a deep learning algorithm via 1D CNN.
- ♦ Achieved high device sensitivity and long-term stability through rigorous performance characterization and iterative optimization of fabrication processes.

### **Collaboration Project: Humidity-Enhanced Multimodal Iontronic Sensing System**

*Jun 2023 – Present*

- ♦ Developed a multimodal iontronic sensing platform integrating pressure, temperature, and humidity sensors for smart agricultural applications (e.g., fruit maturity detection).
- ♦ Synthesized and optimized the formula of ionic gels as the active materials of pressure and temperature sensors, and systematically characterized the electrical, thermal, and mechanical properties of materials.
- ♦ Debugged and characterized the sensor performances.
- ♦ Designed and fabricated multimodal tactile sensors arrays and intelligent electronic gloves.
- ♦ Constructed 3D virtual modeling and render simulation images for wearable device demonstration via 3D Studio Max.

## **SCIENTIFIC COMPETITION**

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### **College Students' Innovation and Entrepreneurship Training Program**

*Apr 2023 – May 2025*

*Project Leader*

#### **National Project: Ultra-Sensitive Temperature Sensor Based on Polyionic Elastomer** | Smart Applications

- ♦ Introduced polyionic elastomers to overcome free-ion concentration limits in iontronic temperature sensors, achieving ultra-sensitive flexible sensing performance.
- ♦ Elucidated the temperature-sensing mechanism through theoretical analysis; validated hypotheses via numerical simulations and experimental results.
- ♦ Optimized material composition, synthesis routes, and processing parameters, successfully fabricating polyionic elastomer-based sensors with high temperature responsiveness.
- ♦ Designed and fabricated integrated circuits for flexible sensors, confirming the utility of temperature sensors across multiple fields.
- ♦ Led a multidisciplinary team in research planning, earning recognition as a **National Innovation Project**.

### **The 17<sup>th</sup> "Challenge Cup" Technological Innovation Competition**

*Jan 2023 – Nov 2023*

*Core Team Member, Provincial Bronze Award*

#### **Provincial Project: Displacement-Controlled Smart Hardness Recognition Sensor** | Deep Learning

- ♦ Proposed a convenient and low-cost self-examination medical device for glaucoma by integrating two flexible pressure sensors asymmetrically on a displacement-controlled rubber finger.
- ♦ Conducted literature review on flexible iontronic devices and hardness sensing.
- ♦ Optimized sensor material formulations and fabrication processes to improve sensitivity and stability.
- ♦ Applied deep learning algorithms to achieve 98.6% accuracy in classifying standard hardness blocks.
- ♦ Managed project declarations, academic posters design and defense presentations, securing **provincial grant funding** (No. pdjh2023b0462).

## **SKILL**

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- ♦ **Programming & Software:** Python, MATLAB, JAVA, SolidWorks, AutoCAD, 3D Studio Max, Adobe Photoshop, Jade 5.
- ♦ **Laboratory Technique & Instrument:** SEM, XRD, FTIR, TGA, DSC, RT, XRF, UV-VIS Spectrophotometer, Contact Angle Goniometer, High-Precision Laser Cutting Machine, Precision Ion Polishing System, Magnetron Sputtering Instrument.
- ♦ **Research & Experimental Skill:** Deep Learning, Virtual Model Modeling, 3D printing, Engineering Drawing, Web Design and Development.