

# Liao Haisu

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## PERSONAL PROFILE

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Passionate and dedicated researcher with a strong background in energy harvesting technologies, currently pursuing a master in Electronic Science and Technology. My research has primarily focused on smart prosthetic devices, particularly in developing innovative methods for energy harvesting and its application in enhancing the functionality of prostheses. I am eager to further my studies through a Ph.D. program, with a specific interest in advancing prosthetic foot technology to improve the quality of life for amputees. My goal is to contribute to cutting-edge research that bridges the gap between advanced engineering solutions and practical biomedical applications.

## RESEARCH EXPERIENCE

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### Master Research, College of Engineering, South University of Science and Technology (2022-2024)

- **Optimizing** the shape of a non-uniform piezoelectric **bending beam** for human knee **energy harvester**
- **Optimizing** the **cam** profile for a piezoelectric-based sole **energy harvester**
- **Design** a **self-powered** piezoelectric **monitoring** system based on a passive **prosthesis foot**
- Publishing scientific papers in peer-reviewed journals and conference paper to support the research programme
- Publishing of patents to support the research programme
- Regular attendance and presentation at national and international meetings to publicize and promote the research

### Bachelor Research, College of Mechanical and Electrical Engineering, Central South University (2018-2022)

- Design an obstacle avoidance trolley utilizing thermal energy to drive based on the Stirling engine
- Design the cam profile of above trolley based on fixed trajectories

## RELEVANT RESEARCH SKILLS

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- **Analysis** of human **gait** e.g. gait cycle, joint power and joint angle
- Use of Industrial packages (SOLIDWORKS, ANSYS, and MATLAB) to assist in design e.g. optimization of energy harvester
- Optimizing prosthesis feet using **optimization algorithms** e.g. Whale optimization algorithm and Particle swarm optimization

## AWARDS

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SIAT Dean Scholarship for outstanding students (¥ 1,500) 2023

SUSTECH outstanding graduate student 2023

## EDUCATION

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### Southern University of Science and Technology (2022-2025)

Master, Electronic and Information Engineering: GPA 3.33/4

### Central South University (2018-2022)

Bachelor, Mechanical Manufacture and Automation: GPA 82.42/100

## REFEREES

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Prof Geo Fei, Chinese Academy of Sciences, fei.gao@siat.ac.cn

## PUBLICATIONS

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**Haisu Liao**, Tsunho Wu, Gang Gao, Xinyu Wu, and Fei Gao\*, "Shape optimization of a non-uniform piezoelectric bending beam for human knee energy harvester," *Smart Materials and Structures*, 2024. **(Accepted)**

### CONFERENCE PAPER

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**Haisu Liao**, Yidi Wang, Qiuyu Shi, Ruisen Huang, Fei Gao\*, "Optimization of a Piezoelectric Bending Beam-based Human Knee Energy Harvester," in *Proc. IEEE Int. Conf. on Mechatronics and Automation (ICMA)*, 2022. **(Presented)**

**Haisu Liao**, Zhongliang Ren, Yidi Wang, Xuan Zhao, Xinyu Wu, Fei Gao\*, "Optimizing the cam profile for a piezoelectric-based sole energy harvester," in *Proc. IEEE Int. Conf. on Robotics and Biomimetics (ROBIO)*, 2024. **(Submitted)**

Qiuyu Shi, Xuan Zhao, **Haisu Liao**, Yongji Lin, Ruisen Huang, Xinyu Wu, Fei Gao\*, "Design of magnetorheological brake with adjustable interdigitated comb for lower limb prostheses and exoskeletons," in *Proc. IEEE Int. Conf. on Robotics and Biomimetics (ROBIO)*, 2023.

Yidi Wang, Xuan Zhao, Qiuyu Shi, **Haisu Liao**, Xinyu Wu, Fei Gao\*, "Design and preliminary testing of a piezoelectric-based sole energy harvester," in *Proc. IEEE Int. Conf. on Robotics and Biomimetics (ROBIO)*, 2022.

## Standard TESTS

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- **2023 IELTS**: 7.0 (Listening: 7.5, Reading: 8.0, Writing: 6.0, Speaking: 6.5)