QINGYU ZHANG (Alfred)

Mobile: +4407421738894 | **Email:** qingyu.zhang.23@ucl.ac.uk / alfred.zhang98@gmail.com

Web: https://alfredzhang98.github.io/ (More Project Details Here)

Summary

I am a PhD researcher at University College London (UCL), funded by EPSRC and the China Scholarship Council (CSC), specialising in bioelectronic and robotic systems for intelligent medical interventions. I have a strong background in embedded systems and applied machine learning, with experience spanning hardware–software co-design, multimodal sensing, and reinforcement learning for haptics. My work on a haptic-enhanced bioimpedance needle won the *Best Live Demo Award* at IEEE ISCAS 2025. Before joining UCL, I graduated top of my MSc class (Distinction) from the University of Bristol and worked as an IoT engineer and project manager, co-inventing six patents and receiving the *Outstanding Employee of the Quarter* award at New Oriental AI Research.

My research interests lie at the intersection of bioelectronic system design, medical AI, reinforcement learning for robotics, and multimodal vision-language-action models.

EDUCATION

PhD in Electronic and Electrical Engineering, UCL **Mar 2023 – Now**

MSc in Advanced Microelectronic System Engineering (AMSE), UoB **Sep 2022 - Sep 2023**

- Degree Class: **Distinction** (1st place in the class of years 22-23, overall score 83/100)
- Final project mark: 88/100

***BEng in Optical Electronic Information Engineering*, Huazhong University of Science and Technology** **Sep 2016 - Jul 2020**

- Overall grade: GPA 3.22/4
- Final project mark: 88/100

WORK EXPERIENCE

***Senior IoT Engineer*, New Oriental Education Technology Group (XDF), Beijing, China** **Feb 2021 - Dec 2021**

- Engineered a scalable and configurable full-stack controller on the ESP32 platform for smart classroom systems. Implemented BLE, audio, IMU, and multi-button peripheral integration; contributed to manufacturing of 200+ units.
- Led the development of an AI-enabled edge device for smart classroom instruction, integrating embedded sensing, on-device model inference, and real-time feedback. Supervised three IoT engineers in system design, ML workflow implementation, and modular firmware development.

***IoT Engineer*, Shensi Shudun Technology, Co, Ltd, Beijing, China** **Jul 2020 - Jan 2021**

- Developed Windows-based desktop applications using PyQt6 to streamline and automate assembly-line operations.
- Led the design and implementation of a smart dock for existing air purifiers on STM32 and ESP8266 platforms, featuring one-click network configuration and multi-protocol communication (Wi-Fi, UART, I²C); the system is mass-produced with 1,000+ units annually.
- Optimized the hardware communication architecture on the M263KI chip by extending SPI communication from four to six serial channels, significantly improving data throughput and system efficiency.

SKILLS

- **Coding Skills:** C/C++ (8/10), Python (7/10), Matlab (4/10), Verilog (5/10), Typescript (2/10)
- **Embedded Systems:** Proficient in development across Linux, embedded RTOS, and Android platforms
- **3D Design & Simulation:** Skilled in SolidWorks, Blender, and COMSOL for 3D modelling and simulation, with specialized experience in co-simulating electrical properties, particularly electric field analysis for bioimpedance
- **Circuit Design:** Experienced in PCB schematic design, layout optimisation, and hardware debugging across power management systems, embedded system integration, mixed-signal (analog/digital) circuits, and application-specific integrated circuits
- **Machine Learning Skills:** PyTorch (8/10), with experience in computer vision (e.g., segmentation, classification) and reinforcement learning
- **Robotic Platform:** Hands-on experience with UR collaborative robots, haptic devices (Haply Inverse3), and custom-built robotic prototypes
- **Research and Research Writing Skills**

PUBLICATIONS

Conferences Paper:

- Jiayang Li, **Qingyu Zhang,** Dai Jiang, Sohmyung Ha, Andreas Demosthenous, and Yu Wu, "A 0.62 μW/sensor 82 fps Time-to-Digital Impedance Measurement IC with Unified Excitation/Readout Front-end for Large-Scale Piezo-Resistive Sensor Array," submitted to IEEE International Solid-State Circuits Conference (ISSCC), 2026.
- **Q. Zhang**, A. Al-Hindawi, A. Demosthenous, and Y. Wu, "Haptic enhanced bioimpedance needle for precision navigation in central venous catheterisation with millimetre accuracy," submitted to *2025 IEEE Int. Symp. Circuits Syst.*
- J. Chi, **Q. Zhang**, Z. Zhang, A. Demosthenous, and Y. Wu "High Resolution Plantar Pressure Insole System for Enhanced Lower Body Biomechanical Analysis," submitted to 2025 IEEE Int. Symp. Circuits Syst.
- J. Zhang, **Q. Zhang**, Y. Wu, D. Jiang and A. Demosthenous "A Method for Improving the Wearability of Capsule Positioning System Using Particle Filter," submitted to 2025 IEEE Int. Symp. Circuits Syst.

Live Demo Paper:

- **Q. Zhang**, A. Al-Hindawi, A. Demosthenous, and Y. Wu, "Live Demonstration: Haptic-Enhanced Bioimpedance Needle for Assisting Central Venous Catheterisation," submitted to *2025 IEEE Int. Symp. Circuits Syst.*
- J. Chi, **Q. Zhang**, Z. Zhang, A. Demosthenous, and Y. Wu, "Live Demonstration: A High-Resolution Plantar Insole System for Lower Body Estimation," submitted to *2025 IEEE Int. Symp. Circuits Syst.*

PATENTS

- 'Image processing method and apparatus, electronic device and computer-readable storage medium', CN115393922A, 2022
- 'Data processing methods, apparatus, storage media and electronic devices', CN114969790A, 2022
- 'Attitude recognition method, apparatus, storage medium and electronic device', CN114782994A, 2022
- 'Sitting posture recognition method, device and storage medium', CN114821652A, 2022
- 'Face recognition method, apparatus, storage medium and electronic device', CN114998955A, 2022
- 'Image processing method, apparatus, storage medium and electronic device', CN114913181A, 2022

AWARDS

- Best live demo, ISCAS, 2025
- Outstanding Employee of the Quarter in 2021, top 1.5% of 200 colleagues in the AI research institute of XDF
- Outstanding graduate from HUST in BEng and BA college in 2020
- Academic Progress Scholarship in HUST in 2019
- Outstanding Student Cadres Scholarship in HUST in 2018 and 2019
- Scientific and Technological Innovation Scholarship in HUST in 2018
- Third prize in the Mathematical Modelling Competition in central China in 2018, the top 5% of 2000 groups
- Second prize at HUST Entrepreneur Camp in 2018, second out of 26 teams

RESEARCH & PROJECTS (Click Here To Read Details)

Research assistant: Developing the smart insole related hardware and software system **Mar 2025 – Sep 2025**
Research assistant: Developing the ultra-low power embedded system for in vivo stimulation **Oct 2024 – Apr 2025**
PhD research: Bioimpedance needle trajectory system **May 2024 - Oct 2024**

- Conducted structural analysis of the bioimpedance needle using COMSOL Multiphysics.
- Developed a complete experimental system integrating an embedded Bluetooth module, a haptic robot, and a user interface.
- **Key result:** In 24 user trials on a venous phantom, the system achieved a 100% successful entry rate, a 0.66 mm RMS error, and an 87% probability of positioning within ±1 mm of the vein center. The system was evaluated by NHS collaborators for potential medical needle navigation applications.

MSc project: design and modelling of power conditioning circuits for triboelectric nanogenerator **May 2023 - Sep 2023**

- Performed finite element analysis in COMSOL to model and analyze a triboelectric nanogenerator (TENG).
- Designed an analytical TENG model in Verilog-AMS using Cadence.
- Developed a reliable and efficient power management circuit for a bladder actuator based on the TENG models.
- **Key result:** The system generates 3.25 mAh of energy per day with a 23% conversion efficiency, outperforming most designs.

BEng project: design and optimisation of geomagnetic algorithm based on DSP **Feb 2020 - Jun 2020**

- Optimized the World Magnetic Model 2020 (WMM2020) algorithm.
- Implemented the algorithm on a DSP platform with a focus on hardware performance enhancement.
- **Key result:** Achieved a relative error below 0.003% and a computation time of 0.57 ms, delivering twice the performance of existing systems at the time.

Research Assistant at China National Photovoltaic Laboratory **Oct 2019 - Jan 2020**

- The project, funded by Huawei, aims to measure blood flow rate and oxygen level through laser scattering imaging
- Set up the camera–laser experimental platform and optimized the laser scattering imaging algorithms.
- **Key results:** Generated thermal maps indicating blood flow rate and time-varying blood oxygen curves. Compared with existing methods, these results enable both measurements using standard mobile phones.