Minghui (Scott) Zhao

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Education

Columbia University *New York, NY*
PhD Student in Electrical Engineering Expected May 2027

Columbia University *New York, NY*
MS in Computer Engineering, GPA 3.79 / 4.0 Expected May 2022
Courses: Operating Systems, IoT and Cloud Computing, Computer Networking, Robotics, Software as a Service, Formal Verification

University of California San Diego *La Jolla, CA*
BS in Electrical Engineering, Minor in Mathematics, GPA 3.72 / 4.0 Aug 2016 – Dec 2020
Courses: C, C++, Python for Data Analysis, Data Networks, Computer Architecture, Embedded Systems, Rapid Prototyping, Analog Design, Digital Design, Linear System Fundamentals

Academic Experience

Columbia Intelligent and Connected Systems Lab *New York, NY*
Research Assistant Sep 2021 – Present
- Developed a plug-and-play platform for sensors to allow hassle-free data acquisition on a custom mix-and-matched set of sensors
- Defined and evaluated the system architecture regarding ease-of-use, flexibility, and scalability
- Implemented the software middleware and drivers; designed and assembled several hardware sensor modules

Columbia University Electrical Engineering Department *New York, NY*
Teaching Assistant Sep 2021 – Dec 2021
- Worked as a teaching assistant for EECS E4764: Internet of Things - Intelligent and Connected Systems
- Helped and mentored students with their hands-on projects on embedded systems, cloud computing and data visualization, prepared lab section presentations, improved lab instructions and assignments, and developed exams

Bharadia Lab UCSD *La Jolla, CA*
Research Assistant Apr 2019 – Oct 2021
- Developed an indoor tracking system employing an array of ultra-wideband (UWB) radio frequency (RF) transceivers to bring accuracy, latency, scalability, and power consumption on state-of-art UWB systems to a new level
- Worked on an embedded system that controls the UWB transceivers and the PCB for a transceiver array
- Processed the RF signal data and analyzed the performance and limits of the system
- Compared and optimized various methods and algorithms in angle of arrival estimation and location solving to reduce the median localization error to 3.6 cm

Talke Lab UCSD *La Jolla, CA*
Research Assistant Apr 2017 – Jun 2019
- Developed an embedded, wireless, hand and ergonomic motion tracking system to improve the surgical operation training and ergonomic health monitoring of medical students and doctors
- Designed and assembled a PCB for the system and fitted it into a 3D-printed soft watch case and other enclosures
- Compared and analyzed performance and data fidelity on TCP/UDP transmitting protocols and implemented buffering and data recovery algorithms to transmit data at tripled rate while eliminating data loss

UCSD Electrical and Computer Engineering Department *La Jolla, CA*
Undergraduate Teaching Assistant Sep 2016 – Dec 2020
- Worked as a teaching assistant for ECE 5 (Introduction to ECE) and ECE 16 (Rapid Software & Hardware Design) beginning in my freshman year, acquired a 99.5% student recommendation rate in a total of 14 semesters worked
- Led lab section meetings and announcements in addition to other duties, including coordinating tutors on the preparation of material, organizing class project competitions, and developing lab instructions and assignments
- Trained students in hands-on skills, including 3D CAD and printing, PCB design, laser cutting, and soldering

- Interacted with students by answering technical questions, debugging circuits and programs, and inspiring and assisting them in developing their own projects; fostered essential skill sets in more than 1,000 students to facilitate innovative projects and to inspire a practical interest in ECE

Projects (see many more at scottz.net/projects)

AutoPark (*scottz.net/autopark*) Jan 2019 – Mar 2019

- Developed a multi-level parking structure model with automatic car parking
- Designed and assembled seven distinct PCB prototypes with DC and stepper motor drivers and wireless microcontrollers
- Built a 3D model for the system, manufacturing and assembling it with laser cutting and 3D printing
- Programmed "node" microcontrollers to interface with sensors and drive stepper motors, enabling wireless communication with one another and with the host

Tubular Robot (*scottz.net/tr*) Apr 2018 – Jun 2018

- Developed an autonomous terrain exploration and mapping robot with wireless controls and a streaming camera
- Assembled the robot from scratch with a laser-cut tubular chassis and wheels and 3D-printed sensor holders
- Programmed the microcontroller to read sensors, transmit data, and react wirelessly to commands from the PC
- Developed algorithms for obstacle avoidance, autonomous driving, and terrain mapping

Real-Time Traffic Monitoring and Analysis (*scottz.net/traffic*) Dec 2017 – Present

- Programmed a script to collect and plot traffic congestion information from AMap and BaiduMap API in real time
- Optimized the scraping server script for years of stability
- Enabled comparison of traffic data with precipitation data and analyzed weather's contribution to traffic jams

Smart Home Remote Watering (*scottz.net/water*) Jan 2015 – Present

- Built an embedded wireless system to monitor soil humidity and to water plants autonomously or remotely using mobile phones over Wi-Fi
- Enabled GSM connectivity to maintain an internet connection in the absence of Wi-Fi
- Developed a cross-platform mobile app using Flutter to control the system remotely

Publications

- Morris, K., **Zhao, M.**, Lam, J., Jacobsen, G., Horgan, S., & Talke, F. E. (2019, June). A Wearable Neck Measurement Device and Monitoring System to Improve Ergonomic Performance of Surgeons. In *Information Storage and Processing Systems (vol. 59124, p. V001T09A002)*. American Society of Mechanical Engineers. https://doi.org/10.1115/ISPS2019-7513
- **Zhao, M.**, Chang, T., Arun, A., Ayyalasomayajula, R., Zhang, C., & Bharadia, D. (2021, September). ULoc: Low-Power, Scalable and cm-Accurate UWB-Tag Localization and Tracking for Indoor Applications. In *Proceedings of the ACM on Interactive, Mobile, Wearable, and Ubiquitous Technologies. 5, 3, Article 140 (September 2021).* https://doi.org/10.1145/3478124
- Nie, J., Shao, H., **Zhao, M.**, Xia, S., Preindl, M., & Jiang, X. (2022, July). Conversational AI Therapist for Daily Function Screening in Home Environments. In *Proceedings of the 1st ACM International Workshop on Intelligent Acoustic Systems and Applications (pp. 31-36)*. https://doi.org/10.1145/3539490.3539603
- **Zhao, M.**, Xia, S., Nie, J., Hou, K., Dhupar A., & Jiang, X. (2023, May). LegoSENSE: An Open and Modular Sensing Platform for Rapidly-Deployable IoT Applications. In *2023 IEEE/ACM Eighth International Conference on Internet-of-Things Design and Implementation (IoTDI)*. IEEE. https://doi.org/10.1145/3576842.3582369

Extracurricular Activities

- **EnVision Arts and Engineer Maker Studio Volunteer** Jan 2019 – Mar 2020
  Inspired students in their personal and class projects and provided hands-on training on maker tools, including laser cutting, 3D modeling and printing, PCB design, and soldering
- **YonderDeep Student Organization** Sep 2018 – Aug 2019
  Designed the PCB for an autonomous underwater vehicle (AUV) and improved the AUV's software by proposing and developing a more robust code logic using finite state machines; wrote programs in Python for communication between the AUV and the base station and developed PID control algorithms to control and balance the AUV during autonomous navigation and when diving to a specified depth

Honors and Awards

- Columbia University Presidential Fellow
- 2020-2021 Henry G. Booker Memorial Honors Award
- 2020 ECE Best Tutor Award
- First Award. SD Hacks 2019: Best Use of AWS AI/ML Services
- Honorable Mention. LA Hacks 2019: Site 101 Big Data Award

Professional Skills and Languages

- **Languages:** Python, MATLAB, C, C++, LabVIEW, Flutter, Java
- **Software:** SystemVerilog, Autodesk EAGLE, KiCad, Solidworks
- **Manufacturing:** Soldering, 3D Printing, Laser Cutting
- **Other:** Internet of things, embedded systems, Unix, Git
- **Certification:** Certified LabVIEW Associate Developer (CLAD)