Beitong Tian

Graduate Research Assistant

(607) 319-9124
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Website: https://www.beitongtian.com/
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EDUCATION

Ph.D. student in Computer Science, *University of Illinois Urbana-Champaign, 3.94/4.0.* — Aug. 2019–Expected July 2025
Master of Engineering in Electrical and Computer Engineering, *Cornell University, 3.93/4.0.* — Aug. 2017–Dec. 2018
Bachelor of Engineering in Electronic Science and Engineering, *Southeast University, 3.4/4.0.* — Aug. 2013–July. 2017

SKILLS

Software Skills	Python, PyTorch, C++, Swift, MATLAB, Git, LaTeX, MarkDown, ReactJS, MongoDB
Hardware Skills	Raspberry Pi, Arduino, ESP32, Printed Circuit Board(PCB) design, Rapid Prototyping, 3D Printing
Communication	English, Chinese

RESEARCH EXPERIENCE

Graduate Research Assistant / MAINTLET — **July 2021 — Present**
Multimedia Operating Systems and Networking (MONET) Research Group, UIUC — *Champaign, IL*

- Prototyped the first smart safety glasses featuring a monocular display, camera, microphone, speakers, and 3D-printed frame for AI-assisted lab work.
- Designed a computer vision system to read analog gauges using vision models such as CogVLM, LAMA, and SAM.
- Designed an energy-efficient, vision-based indoor localization system using image retrieval and transformer-based neural networks for smart glasses and AI assistants.
- Developed a head-mounted egocentric data collection system to gather multimodal cleanroom user data.
- Trained large vision-language models on egocentric video datasets for activity recognition, applying advanced data augmentation techniques.
- Designed a wireless vibration sensor network for scientific instruments, and built a CNN-based failure detection pipeline.
- Reconstructed 3D Gaussian Splatting scenes for digital twins of lab spaces.

Graduate Research Assistant / Underwater Smart System — **July 2023 — Dec. 2024**
Multimedia Operating Systems and Networking (MONET) Research Group, UIUC — *Champaign, IL*

- Developed the first underwater image transmission system between mobile phones using CSS-modulated acoustic signals.
- Fine-tuned image encoder and decoder with simulated transmission errors, enabling reliable transmission of a 256x256 image over 20 meters within 10 seconds.
- Instruction-tuned a mobile vision-language model with a generated scuba diver conversation dataset to automatically create conversation messages for scuba divers based on diving sensor readings and images.
- Developed neural networks for object detection and image segmentation, optimized for execution on smartphones.
- Built and tested the prototype on the Android and iOS platforms.

Software Engineering Internship — **May 2022 — Aug. 2022, May 2023 — Aug. 2023**
Sensing & Connectivity, Apple — *Cupertino, CA*

- Research in cutting-edge sensing & connectivity technology.

Graduate Research Assistant / SENSELET — **June 2020 — July 2021**
Multimedia Operating Systems and Networking (MONET) Research Group, UIUC — *Champaign, IL*

- Designed and deployed a scalable wireless sensor network for real-time cleanroom environmental monitoring.
- Developed an online, context-aware, and intelligent anomaly detection system for cleanroom data streams.

Undergraduate Research Assistant — **Feb. 2016 — July 2017**
Micro-Nano Biology System Lab, MEMS Lab, Southeast University — *Nanjing, China*

- Developed a microfluidic embedded system for automatic nematode sorting using signal analysis and MATLAB-based data processing.

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PROJECT

Course Final Project / BTracker: A Multi-functional Barbell Exercise Tracker   Jan. 2022 — May 2022
University of Illinois Urbana-Champaign   *Champaign, IL*

- Built a multi-modal barbell exercise tracker with dual-camera and IMU integration.
- Created a web-based dashboard with FastAPI and WebSocket for visualization and real-time control.
- Engineered an ML-based classifier to detect exercise types from motion data.

Course Final Project / Indoor Localization with Acoustic Signals   Sept. 2021 — Dec. 2021
University of Illinois Urbana-Champaign   *Champaign, IL*

- Designed a Raspberry Pi-based sensing system using geophones and microphones for indoor localization.
- Built a real-time client-server pipeline for streaming, analysis, and visualization.

Course Final Project / Propeller Displayer (Arduino + Raspberry Pi)   Nov. 2017 — Dec. 2017
Cornell University   *Ithaca, NY*

- Developed a propeller display system combining music spectrum analysis and motion using Hall sensors, LEDs, and motors.

Intelligent Interface for Fitness Center   Summer 2016
Southeast University   *Nanjing, China*

- Built an IoT fitness interface with HR/EMG sensors, RFID, and Linux-based GUI.
- Designed and 3D-printed a smart sensor module for automatic workout tracking.

National Undergraduate Electronic Design Contest / Lithium Battery Charge/Discharge System   July 2015 — Dec. 2015
Southeast University   *Nanjing, China*

- Created an STM32-based embedded system for DC-DC converter control and monitoring.
- Won 1st Prize in the National Undergraduate Electronic Design Contest.

PUBLICATION

- **Tian, B.**, Zhao, L., Chen, B., Wu, M., Zheng, H., Vasisht, D., ... & Nahrstedt, K. (2025). AquaScope: Reliable Underwater Image Transmission on Mobile Devices. arXiv preprint arXiv:2502.10891.
- **Tian, B.**, Wu, M., Zhang, R., Zheng, H., Chen, B., Wang, Y., ... & Nahrstedt, K. (2024, August). GaugeTracker: AI-Powered Cost-Effective Analog Gauge Monitoring System. In 2024 IEEE 7th International Conference on Multimedia Information Processing and Retrieval (MIPR) (pp. 477-483). IEEE.
- **Tian, B.**, Eslaminia, A., Lu, K.C., Wang, Y., Shao, C., & Nahrstedt, K., (2023, October). WeldMon: A Cost-effective Ultrasonic Welding Machine Condition Monitoring System. In 2023 IEEE 14th Annual Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON) (pp. 0310-0319). IEEE. **(Best Student Paper Award)**
- **Tian, B.**, Yang, Z., Moeini, H., Gupta, R., Su, P., Kaufman, R., ... & Nahrstedt, K. (2021, October). SENSELET++: A Low-cost Internet of Things Sensing Platform for Academic Cleanrooms. In 2021 IEEE 18th International Conference on Mobile Ad Hoc and Smart Systems (MASS) (pp. 90-98). IEEE.
- Eslaminia, A., Jackson, A., **Tian, B.**, Stern, A., Gordon, H., Malhotra, R., ... & Shao, C. (2024). FDM-Bench: A Comprehensive Benchmark for Evaluating Large Language Models in Additive Manufacturing Tasks. arXiv preprint arXiv:2412.09819.
- Pi, X., Wu, M., Jiang, J., Zheng, H., **Tian, B.**, Zhai, C., ... & Hu, Z. (2024, November). UOUO: Uncontextualized Uncommon Objects for Measuring Knowledge Horizons of Vision Language Models. In Proceedings of the 2024 Conference on Empirical Methods in Natural Language Processing (pp. 6432-6441).
- Wu, M., Ji, R., Zheng, H., Li, J., **Tian, B.**, Chen, B., ... & Nahrstedt, K. (2024, October). Scene Graph Driven Hybrid Interactive VR Teleconferencing. In Proceedings of the 32nd ACM International Conference on Multimedia (pp. 11276-11278).
- Gupta, R., **Tian, B.**, Wang, Y., & Nahrstedt, K. (2024). TWIN-ADAPT: Continuous Learning for Digital Twin-Enabled Online Anomaly Classification in IoT-Driven Smart Labs. Future Internet, 16(7), 239.
- Zhang, Y., Wu, M., **Tian, B.**, Li, J., Chen, B., Zhou, Q., & Nahrstedt, K. (2023, December). SAVG360: Saliency-aware Viewport-guidance-enabled 360-degree Video Streaming System. In 2023 IEEE 25th International Symposium on Multimedia (ISM). IEEE.
- Gupta, R., **Tian, B.**, Nahrstedt, K., & Danilov C. (2023, November). RESONATE: Advancing Sustainability in IoT Networks Through Smart and Selective Data Streaming. In 2023 IEEE 9th International Conference on Collaboration and Internet Computing (CIC 2023). IEEE.

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- Guo, H., **Tian, B.**, Yang, Z., Chen, B., Zhou, Q., Liu, S., ... & Danilov, C. (2023). DeepStream: bandwidth-efficient multi-camera video streaming for deep learning analytics. arXiv preprint arXiv:2306.15129.
- Zhou, Q., Yang, Z., Guo, H., **Tian, B.**, & Nahrstedt, K. (2022, December). 360BroadView: Viewer Management for Viewport Prediction in 360-Degree Video Live Broadcast. In Proceedings of the 4th ACM International Conference on Multimedia in Asia (pp. 1-7).
- Nahrstedt, K., Gupta, R., **Tian, B.**, Yang, Z., Su, P., Kaufman, R., Wang, X., Wang, C., Espenhahn, L., Eslaminia, A., Dallesasse, J., Pezzarossi, G., & Sardela, M. (2022, August). Sensing and Computing Challenges in Academic Ultra-Clean Environments for Enhanced Data Integrity. Open Access Government.
- Zhu, Z., Chen, W., **Tian, B.**, Luo, Y., Lan, J., Wu, D., ... & Pan, D. (2018). Using microfluidic impedance cytometry to measure C. elegans worms and identify their developmental stages. Sensors and Actuators B: Chemical.
- Chen, W., **Tian, B.**, Lan, J., Chen, D., & Zhu, Z. (2017, June). Using microfluidic impedance cytometry to identify the life stages of C. elegans nematodes. In Solid-State Sensors, Actuators and Microsystems (TRANSDUCERS), 2017 19th International Conference on (pp. 1628-1631). IEEE.

Patent

- **B. Tian**, "A New Bluetooth Audio Speaker" (Utility Model Patent, Grant), patented by State Intellectual Property Office of the PRC (Patent No.: CN 205545858 U).
- **B. Tian**, G. Hou, Z. Zhao, "A Smart Gym Lock Pin Intelligent Gymnasium System" (Invention Patent, Application), patented by State Intellectual Property Office of the PRC (Patent No.: CN 106310639 A).

Teaching

- MSE 598: Intro to Digital Materials, University of Illinois Urbana-Champaign, Student Instructor. Spring 2021 & 2022 & 2023 & 2024
- CS241: System Programming, University of Illinois Urbana-Champaign, Teaching Assistant. Fall 2019 & Spring 2020