DHAIRYA SHAH

Wireless and Embedded Systems Researcher

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EDUCATION

National University of Singapore (NUS) | Singapore — Aug 2024 – Present
Doctor of Philosophy (Ph.D.) in Computer Science
Advisor: Prof. Ambuj Varshney
Thesis: Standalone Microwatt Radios for Communication and Sensing, and the AI Agents that Build Them

Veermata Jijabai Technological Institute (VJTI) | Mumbai, India — Aug 2019 – Jun 2023
Bachelor of Technology (B.Tech) in Electronics and Telecommunication Engineering — **CPI: 9.75/10**
Awards: **University Rank: 1/756** - Secured highest CPI across all B.Tech majors.

PUBLICATIONS

** co-primary authors*

1. **LoopHIL: Looping Hardware into LLM-assisted Agents for Wireless Embedded Systems**
   D. Shah, S. Sara, S. V. Kandala, A. Varshney — Under Review
2. **Microwatt Microwave (M^2) Oscillator: Going Beyond the Delegation Architecture of Low-power Wireless Communication** — GitHub
   D. Shah*, P. Medaranga*, C. R. Reddy, S. Sara, P. Dutta, A. Varshney — ACM MobiSys '26
   Featured Paper: Top 10/302
3. **HILO: Enabling Low-power, Dual-Band Communication using Tunnel Diode Oscillators**
   D. Shah*, C. R. Reddy*, P. Medaranga, A. Varshney — IEEE RFID '26
4. **AudioCast: Enabling Ubiquitous Connectivity for Embedded Systems through Audio Broadcasting Low-power Tags** — GitHub
   D. Shah*, C. R. Reddy*, N. Ang, A. Varshney — ACM IMWUT '25
   IMWUT Distinguished Paper Award (Top 8/200)
5. **TunnelSense: Low-Power, Non-Contact Sensing using Tunnel Diodes**
   D. Shah*, T. Lim*, C. R. Reddy*, Y. Bhadauria, M. Gulati, A. Varshney — IEEE RFID '24
6. **Li-FiAR: Networking Augmented-Reality Devices through Visible Light**
   D. Shah*, M. Shah*, P. Medaranga, A. Varshney — ACM S3: MobiCom '24
7. **PixelGen: Re-thinking Embedded Cameras for Mixed-Reality** — GitHub
   D. Shah*, K. Li*, M. Gulati*, et al. — ACM ImmerCom: MobiCom '24

EXPERIENCE

Nokia Bell Labs | Cambridge, UK — May 2025 – Aug 2025
Research Intern — Advisors: Chulhong Min, Fahim Kawsar
Built a distributed edge–cloud framework to deploy multimodal sensory LLM pipelines on embedded devices for low-latency, privacy-preserving health applications.

WEISER Group, National University of Singapore | Singapore — Nov 2023 – Aug 2024
Research Assistant — Advisor: Prof. Ambuj Varshney
Built PixelGen, a low-power embedded camera platform for XR devices that pairs low-resolution image and environmental sensors with local generative models to generate high-resolution visuals.

SENS Lab, EPFL | Lausanne, Switzerland — Jun 2023 – Sep 2023
Summer@EPFL Research Intern — Advisors: Prof. Haitham Al Hassanieh, Junfeng Guan
Developed a mmWave joint communication-and-sensing testbed with phased-array beamforming and fast electronic beam steering (20 ms/beam; full spatial scan < 1.26s).

CRITIAS Lab, École de Technologie Supérieure | Montreal, Canada — May 2022 – Aug 2022
Research Intern — Advisor: Prof. Jérémie Voix
Developed a multimodal synchronization platform for precise alignment of audio and biosensory streams.

Espressif Systems | Pune, India — Dec 2022 – Jun 2023
Embedded Software Intern — Team: ESP-Matter Development Team
Contributed to Espressif's firmware stack for Matter enabled IoT devices.

The Linux Foundation | Remote — Sep 2021 – Nov 2021
Open Source Developer — Organization: RISC-V
Worked on RISC-V (RV64GC) porting and regression testing of SpiderMonkey's Baseline JIT compiler.

AWARDS & FELLOWSHIPS

- **Distinguished Paper Award**: ACM IMWUT '25
- **Best Demo Honorable Mention**: ACM/IEEE ISLPED '26
- **Best Poster Runner-Up and Featured Paper**: ACM MobiSys '26
- **NUS Research Achievement Award**: Selective award for research excellence
- **ACM SIGCHI Travel Grant**: ACM UbiComp '25
- **NUS Travel Grant**: ACM MobiCom '26 & '24, IEEE RFID '26, ACM UbiComp '25
- **Best Demo Runner-Up**: ACM/IEEE IPSN '24
- **NUS PhD Research Fellowship**: Doctoral fellowship at National University of Singapore
- **EPFL MSc Research Fellowship**: Selective research fellowship for pursuing Master's at EPFL
- **Summer@EPFL Research Fellow '23**: Selective research internship at EPFL ($< 1.2\%$ acceptance)
- **Director's Gold Medal**: University Rank 1 (highest CPI across all B.Tech cohorts at VJTI)
- **Baroda Achiever's Award**: Scholarship for academic excellence
- **Mitacs Globalink Research Fellowship '22**: Research internship at ETS Montreal, Canada
- **Linux Foundation Fellowship '21**: Open-source mentorship fellowship (RISC-V)
- **Delta International Smart & Green Automation Contest '21**: Second Prize worldwide
- **e-Yantra eYRC Robotics Challenge '21**: All India Top 20 finalist

SKILLS

RF Design	Low-power transceivers and oscillators, dual-band radios, mmWave, RF PCB and antenna design
Wireless Systems	Backscatter, phased-array beamforming, RF sensing (ISAC), visible light (Li-Fi), data streaming
Protocols	BLE, Wi-Fi, LoRa, Zigbee, Matter
Embedded	MSP430, ESP32, STM32, Ambiq Apollo, FPGA; bare-metal, FreeRTOS, ESP-IDF; I2C/SPI/UART
Hardware & Test	KiCad, Altium, LTspice, ADS/HFSS; SDRs, spectrum analyzer, VNA, oscilloscope
Programming	C, C++, Python, MATLAB; PyTorch, GNU Radio, signal processing
AI & XR	LLM agents with hardware in the loop; XR devices (Meta Quest, Xreal)

POSTERS & DEMOS

1. **Going Beyond the Delegation Architecture of Low-power Wireless Communication**
   D. Shah*, P. Medaranga*, C. R. Reddy, S. Sara, P. Dutta, A. Varshney — Poster: ACM MobiSys '26
   Best Poster Runner-Up Award
2. **Microwatt Microwave (M^2) Oscillator: Enabling 105 µW, Stable and Standalone Transceivers**
   D. Shah*, P. Medaranga*, C. R. Reddy, S. Sara, P. Dutta, A. Varshney — Design Contest: ACM/IEEE ISLPED '26
   Best Demo Honorable Mention Award
3. **Enabling Low-power Data Streaming through Microwatt Microwave Transceivers**
   D. Shah*, P. Medaranga*, C. R. Reddy, S. Sara, P. Dutta, A. Varshney — Demo: ACM MobiCom '26
4. **ZeCoST: Zero-Compute Streaming Sensors using Tunnel Diodes**
   C. R. Reddy*, P. Medaranga*, D. Shah, et al. — WIP: ACM MobiCom '26
5. **Ubiquitous Battery-free Sensing AirTags**
   S. Sara, D. Shah, P. Medaranga, C. R. Reddy, A. Varshney — Demo: ACM MobiSys '26, N2Women
6. **VisibleBits: Illuminating Mixed Reality with Li-Fi Information Spotlights**
   C. Xuan, D. Shah, A. Varshney — Demo: ACM MobiCom '25

7. **Enabling Low-power Ubiquitous Connectivity for Embedded Systems through Audio Broadcasting Tags**
   D. Shah*, C. R. Reddy*, A. Varshney — Demo: ACM UbiComp '25 & MobiSys '25
8. **GateHaul: A Gateway Architecture using Backhauling Networks to Address the Connectivity Challenges of Embedded Systems**
   S. Sara, M. Shah, D. Shah, C. R. Reddy, A. Varshney — Demo: ACM MobiCom '24
9. **Simplifying the Networking of Wireless Embedded Systems using a Large Language Model**
   D. Shah*, P. Medaranga*, S. V. Kandala*, A. Varshney — Poster: ACM SIGCOMM '24
10. **PixelGen: Rethinking Embedded Camera Systems for Mixed-Reality**
    K. Li*, M. Gulati*, D. Shah, S. Waskito, S. Chakrabarty, A. Varshney — Demo: ACM/IEEE IPSN '24
    Best Demo Runner-Up Award
11. **Enabling Non-contact, Low-Power Sensing using Tunnel Diodes**
    Y. Bhadauria*, T. Lim*, C. R. Reddy*, M. Gulati, D. Shah, A. Varshney — Poster: ACM/IEEE IPSN '24

INVITED TALKS

- **Enabling Ubiquitous Connectivity for Embedded Systems through Audio Broadcasting Low-power Tags**
  Systems and Networking Area Seminar, NUS Computing — 2025
- **Standalone Microwatt Connectivity for a Battery-free World**
  Three Minute Thesis (3MT), ACM S3 Workshop, MobiCom — 2026
- **Going Beyond the Delegation Architecture of Low-power Wireless Communication**
  Systems and Networking Area Seminar, NUS Computing — 2026

TEACHING

CS4222/5422: Wireless Networking, NUS — Spring '25, '26

VOLUNTEERING

ACM S3 Workshop: MobiCom '26 | Technical Program Committee Reviewer — Fall 2026
Graduate Students Society (GSS), NUS | Director of Community Affairs — Aug 2025 – Jun 2026
| Creativity Secretary — Aug 2024 – Jun 2025
Society of Robotics and Automation (SRA), VJTI | Joint General Secretary & Treasurer — Jun 2020 – Jun 2022