DHAIRYA SHAH

Embedded and Wireless Systems Researcher

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EDUCATION

National University of Singapore (NUS) | Singapore — Aug 2024 - Present
Doctor of Philosophy (Ph.D.) in Computer Science — **CPI: 4.4/5**
Advisor: Prof. Ambuj Varshney

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

** indicates equal contributions*

1. **Tunnel Oscillator: Going Beyond the Delegation Architecture of Low-power Wireless Communication**
   D. Shah*, P. Medaranga*, C. Reddy, S. Sara, P. Dutta, A. Varshney — In Review: ACM MOBISYS '26
2. **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
3. **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
4. **Li-FiAR: Networking Augmented-Reality Devices through Visible Light**
   D. Shah*, M. Shah*, P. Medaranga, A. Varshney — ACM S3 Workshop: MOBICOM '24
5. **PixelGen: Re-thinking Embedded Cameras for Mixed-Reality** — Github
   D. Shah*, K. Li*, M. Gulati* et al. — ACM ImmerCom Workshop: MOBICOM '24

POSTERS & DEMOS

1. **VisibleBits: Illuminating Mixed Reality with Li-Fi Information Spotlights**
   C. Xuan, **D. Shah**, A. Varshney — Demo: ACM MOBICOM '25
2. **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
3. **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
4. **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
5. **PixelGen: Rethinking Embedded Camera Systems for Mixed-Reality**
   K. Li*, M. Gulati*, **D. Shah**, S. Waskito, S. Chakrabarty, A. Varshney — Demo: IPSN '24
   Award: **Best Demonstration Runner-Up**
6. **Enabling Non-contact, Low-Power Sensing using Tunnel Diodes**
   Y. Bhadauria*, T. Lim*, C. R. Reddy*, M. Gulati, **D. Shah**, A. Varshney — Poster: IPSN '24

RESEARCH EXPERIENCE

Nokia Bell Labs | Cambridge, United Kingdom — May 2025 - Aug 2025

Research Intern with **Dr. Chulhong Min, Fahim Kawsar**

- Designed a distributed edge-cloud framework to deploy multi-modal Large Language Models (LLMs) on resource-constrained embedded and wearable devices.
- Characterized system bottlenecks and optimized inference pipelines to enable privacy-preserving, low-latency health monitoring with minimal cloud dependency enabled with **on-device AI**.

WEISER Group, National University of Singapore | Singapore

Research Assistant with **Prof. Ambuj Varshney** — Nov 2023 - Aug 2024

- Extended the limited battery life of **XR** devices by developing energy-efficient architectures that replace onboard power-expensive radio, high-resolution cameras, and high-bandwidth sensors.
- Designed **PixelGen**–a low-power, embedded AI camera that enables novel world visualizations.
- Developed low-power RF transceivers for communication and sensing with less than 200 μW power draw.

SENS Lab, EPFL | Lausanne, Switzerland — June 2023 - Sept 2023

Research Intern with **Prof. Haitham Al-Hassanieh, Dr. Junfeng Guan**

- Engineered and calibrated a software-defined **mmWave** testbed for Joint Communication and Sensing (**JCAS**), utilizing a phased-array frontend to synthesize precise directional radiation patterns.
- Designed beamforming codebooks and implemented rapid beam-steering algorithms to achieve a switching latency of **20 ms/beam**, enabling a complete spatial scan under 1.26 seconds.
- Awarded the highly selective **Summer@EPFL Fellowship** to conduct this research ($\approx 60/4000$ awardees).

CRITIAS Lab, École de Technologie Supérieure ÉTS | Montreal, Canada — May 2022 - Aug 2022

Research Intern with **Prof. Jérémie Voix**

- Developed a multi-stream synchronization platform to ensure precise temporal alignment between high-fidelity audio streams and heterogeneous bio-sensory data (ECG, PPG), etc.
- Awarded the **Mitacs Globalink Research Fellowship** to conduct this research.

Centre of Excellence: COE - CNDS Lab, VJTI | Mumbai, India — May 2021 - Dec 2021

Research Intern with **Prof. Faruk Kazi** — Github | Demo

- Created Pick, Sort, & Place Bot (PSP)—a 5 axis gantry-based economical, industrial solution for automated parcel pick-place and packaging operation.
- Integrated software with a network of industrial automation components— *PLC, HMI, IIoT router, etc.*
- Secured **Rank 2 worldwide** in the *Delta Cup 2021* securing a **US $25000** hardware grant.

INDUSTRY EXPERIENCE

Espressif Systems India Pvt. Ltd. | Pune, India — Dec 2022 - Jun 2023

Embedded Software Intern with **ESP-Matter Development Team**

- Provided firmware and SDK support for Espressif's Matter enabled smart IoT devices.
- Solved existing issues in **esp-matter** and provided **feature requests** for embedded devices.

The Linux Foundation Mentorship with RISC-V | Mumbai, India — Sept 2021 - Nov 2021

Open Source Developer at PLCT Lab, ISCAS, with **Mr. Wei Wu** — Docs | Certificate

- Worked on regression testing, porting Spidermonkey's Baseline JIT Compiler to RISC-V RV64GC ISA.
- Cross-compiled **Spidermonkey**: Mozilla Firefox's JS & Web Engine on RV64GC Fedora Linux.

SKILLS

Languages	C, C++, Python, Matlab, P4, Kotlin, Javascript
Frameworks	ESP-IDF, gnuradio, ROS, Gazebo, riscv-gnu-toolchain, ReactJS
Technologies	GNU Make, CMake, ESP32, STM32, Arduino, Raspberry Pi, MSP430, Apollo Ambiq, RISC-V
Softwares	GNUOctave, Eagle, KiCAD, Multisim, Logisim, Proteus, Spice, CANopen, ISPSoft

POSITIONS OF RESPONSIBILITY

Graduate Students Society (GSS), NUS
Student Life & Creativity Secretary — Aug 2024 - Present

Society of Robotics and Automation (SRA), VJTI
Joint General Secretary and Core Member — June 2020 - June 2023

COMPETITIONS

The 7th Delta International Smart & Green Automation Contest — May 2021 - Aug 2021

- Lead Presenter and member of the winning team **Rank: 2/100**, represented **India**, at the contest organized by Delta Electronics during the **pandemic**.
- **Felicitated** by Hon. Higher Technical Education Minister of the state .

The all India e-Yantra eYRC Robotics Challenge — Sept 2020 - March 2021

- Led my team to **Top 20/100** & devised a system using **pick and place drones** for parcel delivery.

AWARDS & FELLOWSHIPS

- **ACM Travel Grant**: Awarded conference travel grant by ACM for attending UbiComp '25
- **NUS Travel Grant**: Awarded conference travel grant by School of Computing for presenting at MobiCom '24 and UbiComp '25
- **Best Runner-Up Demo**: Awarded runner-up for presenting the best out of **13 demos** at IPSN 2024
- **NUS Research Fellowship**: Awarded a four-year fellowship to pursue **doctoral** studies at NUS
- **Summer@EPFL Research Scholar 2023**: Awarded a 3-month fellowship to conduct research at EPFL
- **Director's Gold Medal**: Awarded scholarship for securing highest CPI across **756** university students
- **Baroda Achiever's Award**: Awarded scholarship for top academic performance by Bank of Baroda
- **Mitacs Research Fellowship 2022**: Awarded a fellowship to conduct research at ETS-Montreal
- **Globalink Graduate Fellowship**: Awarded a fellowship to pursue higher studies in Canada
- **Linux Foundation Fellowship 2021**: Awarded an open-source fellowship by the Linux Foundation