

AAKRITI JAIN

aakriti.jain@utdallas.edu | +1 (332) 248 7111 | aakriti-jain.github.io
Google Scholar: scholar.google.com/citations?user=qqWOQgIAAAAJ

EDUCATION

Ph.D., Computer Science (GPA: 4.00/4.00) The University of Texas at Dallas, USA Advisor: Prof. Abusayeed Saifullah	Expected May 2027
M.S., Computer Science (GPA: 4.00/4.00) Wayne State University, USA	2024
B.Tech., Electronics and Communications Engineering (CGPA: 9.3/10) ADGITM, Guru Gobind Singh Indraprastha University, New Delhi, India	2021

RESEARCH INTERESTS

Internet of Things (IoT) • Real-Time and Embedded Systems • Wireless Networks • Low-Power Wide-Area Networks (LPWANs) • Cyber-Physical Systems (CPS) • Energy-Harvesting and Battery-Free Systems

Research Summary. I build low-power wireless systems that enable timely, reliable, and energy-efficient communication for wide-area industrial IoT and CPS, from oil fields and smart grids to remote process plants. In LPWANs, thousands of energy-constrained devices contend for the same channel under random access, which makes meeting stringent deadlines within tight energy budgets a fundamental challenge. My research brings real-time operation to LPWANs such as LoRa and LR-FHSS through collision- and deadline-aware medium access control (MAC) protocols that remain reliable even under bursty traffic, energy-aware communication for intermittently powered devices, and scheduling-control co-design that treats the network as part of the control loop. My broader work encompasses latency-aware data collection using mobile sinks, cross-technology communication from LR-FHSS to LoRa, and ML-based scheduling for multicore processors. I validate these designs on software-defined radio (SDR) prototypes with GNU Radio and USRP B200, multi-node COTS LoRa testbeds, and large-scale simulation and optimization in NS-3, PyTorch, and Gurobi. Next, I aim to bring these guarantees to direct-to-satellite and 5G/6G IoT.

PUBLICATIONS

Venues: *RTSS*, *SenSys*, *RTAS*, *ICCPs*, *DCOSS-IoT*, *IoTDI*, *TCPS*, and *TECS*.
Each title links to its full text. * Co-first author.

Conference Papers

- [C7] Md Ashikul Haque, **Aakriti Jain**, Venkata Prashant Modekurthy, Abusayeed Saifullah. *Enabling Cross Technology Communication from LR-FHSS to LoRa*. In Proc. ACM/IEEE International Conference on Embedded Artificial Intelligence and Sensing Systems (**SenSys 2026**), CPS-IoT Week 2026, pp. 102–114. Acceptance rate: 19.8%.
- [C6] Abusayeed Saifullah, Nasif Ahmed, **Aakriti Jain**, Md Yusuf Sarwar Uddin, Mohammad Ashiqur Rahman. *Latency-Optimized Data Harvesting in LoRa Networks Using a Mobile Sink*. In Proc. IEEE Real-Time and Embedded Technology and Applications Symposium (**RTAS 2026**), pp. 360–372. Acceptance rate: 25.2%.
- [C5] **Aakriti Jain**, Venkata Prashant Modekurthy, Abusayeed Saifullah, Marco Brocanelli. *Co-Scheduling of Charging and Transmission in Supercapacitor Powered IoT*. In Proc. IEEE International Conference on Distributed Computing in Smart Systems and the Internet of Things (**DCOSS-IoT 2026**), pp. 137–144. Acceptance rate: 23.9%.
- [C4] **Aakriti Jain**, Md Ashikul Haque, Abusayeed Saifullah, Haibo Zhang. *Burst-MAC: A MAC Protocol for Handling Burst Traffic in LoRa Network*. In Proc. IEEE Real-Time Systems Symposium (**RTSS 2024**), pp. 148–160. Acceptance rate: 22.8%.
- [C3] **Aakriti Jain***, Venkata Prashant Modekurthy*, Abusayeed Saifullah. *Control over Low-Power Wide-Area Networks*. In Proc. ACM/IEEE International Conference on Cyber-Physical Systems (**ICCPs 2024**), CPS-IoT Week 2024, pp. 192–201. Acceptance rate: 23%.
- [C2] Mohammad Pivezhandi, **Aakriti Jain**, Abusayeed Saifullah, Ali Jannesari. *Work-In-Progress: Energy and Thermal-Aware Scheduling based on HMARL for OpenMP DAG Workloads*. In Proc. IEEE Real-Time Systems Symposium (**RTSS 2024**), Brief Presentations Track, pp. 455–458.
- [C1] Sezana Fahmida, Venkata Prashant Modekurthy, Dali Ismail, **Aakriti Jain**, Abusayeed Saifullah. *Real-Time Communication over LoRa Networks*. In Proc. ACM/IEEE International Conference on Internet-of-Things Design and Implementation (**IoTDI 2022**), CPS-IoT Week 2022, pp. 14–27.

Journal Articles

- [J2] **Aakriti Jain***, Venkata Prashant Modekurthy*, Abusayeed Saifullah. *Real-Time Scheduling and Control Co-Design over LPWAN*. ACM Transactions on Cyber-Physical Systems (TCPS), 10(3), Article 27, July 2026, 26 pages. doi:10.1145/3785136.
- [J1] Sezana Fahmida*, **Aakriti Jain***, Venkata Prashant Modekurthy*, Dali Ismail, Abusayeed Saifullah. *RTPL: A Real-Time Communication Protocol for LoRa Network*. ACM Transactions on Embedded Computing Systems (TECS), 24(1), Article 17, January 2025, 31 pages. doi:10.1145/3702209.

Manuscripts Under Review

- [U2] **Aakriti Jain**, Abusayeed Saifullah, Haibo Zhang. *Random or Deterministic? Coordinating Frequency and Time for Collision Avoidance in LR-FHSS*. Under review at **ACM MobiCom 2027**.
- [U1] **Aakriti Jain**, Abusayeed Saifullah, Haibo Zhang. *Beyond Random Access: Structured Subcarrier Grouping for LR-FHSS*. Under review at **IEEE PerCom 2027**.

RESEARCH EXPERIENCE

Graduate Research Assistant, Dept. of Computer Science

2021 – 2026

Iowa State University, USA (Fall 2021 – Summer 2022), Wayne State University, USA (Fall 2022 – Summer 2025), and The University of Texas at Dallas, USA (Fall 2025 and Summer 2026)

Advisor: **Prof. Abusayeed Saifullah**

- **Coordinated Access for LR-FHSS Networks (ongoing; first-author)**. Random frequency hopping in LR-FHSS causes fragment collisions that grow with network density. Developing structured subcarrier grouping and coordinated frequency-time scheduling as alternatives to purely random access [U1, U2]. Built a Python-based LR-FHSS network simulator and a GNU Radio gateway on USRP B200 for evaluation.
- **Real-Time and Collision-Aware MAC Protocols for LPWANs**. Designed Burst-MAC to handle bursty LoRa traffic, achieving up to $4.5\times$ higher packet reception and $6\times$ lower energy consumption [C4]. Co-developed RTPL, a real-time communication protocol for LoRa, improving deadline satisfaction by 75% without sacrificing throughput or energy [J1, C1]. Evaluated through large-scale NS-3 simulation and physical LoRa testbeds.
- **Scheduling-Control Co-Design for Industrial CPS over LPWANs**. Developed a co-design framework with adaptive sensor sampling that ensures stability and real-time constraints while reducing control cost by at least 80% [J2, C3]. Established, to our knowledge, the first sufficient schedulability condition for LoRa networks.
- **Charging-Transmission Co-Scheduling for Battery-Free IoT**. Developed a multi-objective ILP for joint charging and transmission scheduling in supercapacitor-powered IoT, with an LP-relaxation-based approximation and a lightweight online heuristic. The formulation accounts for stochastic energy harvesting, self-discharge, and time-sensitive packet utility, and the approach improves throughput and packet utility by 10–25% over baselines [C5].
- **Collaborative Projects**. Co-developed, to our knowledge, the first cross-technology communication from LR-FHSS to LoRa on GNU Radio and USRP [C7]. Contributed to drone-assisted LoRa data harvesting with a 2-approximation latency guarantee, reducing collection latency by up to 80% and energy by 30% [C6], and to hierarchical multi-agent reinforcement learning for energy- and thermal-aware multicore scheduling [C2].

AWARDS AND HONORS

Michael E. Conrad Graduate Research Award (Runner-Up)

2025

Wayne State University

- Awarded for the first-author paper *Burst-MAC: A MAC Protocol for Handling Burst Traffic in LoRa Network* [C4], IEEE RTSS 2024; selected by the Graduate Committee from many submissions.

Dean's List, top 5% of graduating class

Winter 2024

College of Engineering, Wayne State University

Graduate Student Professional Travel Award (two-time recipient)

2023, 2024

Wayne State University

TALKS AND POSTERS

Traffic-Aware Protocols for Smart Wireless Networks

Jan 2025

Invited Talk, Wayne State University, Detroit, MI, USA

<i>Burst-MAC: A MAC Protocol for Handling Burst Traffic in LoRa Network</i> Paper Talk, IEEE RTSS 2024, York, UK	Dec 2024
<i>Energy- and Thermal-Aware Scheduling Based on HMARL for OpenMP DAG Workloads</i> Poster, IEEE RTSS 2024, York, UK	Dec 2024
<i>Control over Low-Power Wide-Area Networks</i> Paper Talk, ACM/IEEE ICCPS 2024, Hong Kong, China	May 2024

TEACHING EXPERIENCE

Graduate Teaching Assistant, Dept. of Computer Science The University of Texas at Dallas, USA Course: CS 5390 Computer Networks	Spring and Fall 2026
<ul style="list-style-type: none"> Graded assignments, exams, and project deliverables, providing constructive feedback to support student learning. Mentored students through course projects, clarifying technical requirements and guiding implementation, troubleshooting, and design decisions. Helped students understand course concepts through office hours, technical discussions, and individualized student support. 	
Guest Lecturer, Dept. of Computer Science The University of Texas at Dallas, USA Course: Internet of Things (graduate)	2025
<ul style="list-style-type: none"> Delivered multiple lectures on LoRa networking and network simulation in NS-3. 	
Undergraduate Teaching Assistant, Dept. of Electronics and Communication ADGITM, Guru Gobind Singh Indraprastha University, New Delhi, India Courses: ETEC 405 Wireless Networks, ETEC 310 Data Communication and Networks, ETEC 305 Microprocessors and Microcontrollers, ETCS 260 Computer Organization and Architecture.	2018 – 2020
<ul style="list-style-type: none"> Assisted faculty across four semesters in delivering course materials, preparing lecture notes, and supporting laboratory instruction and student learning. 	

MENTORING

Nasif Ahmed, Ph.D. student, The University of Texas at Dallas Junior doctoral student in our laboratory. Mentored him through his first publication [C6], training him in problem formulation, experiments with COTS LoRa devices, presenting results, and writing systems papers.	Fall 2025 – Present
Punith Jayaramu, M.S. student, Wayne State University Guided his transition from foundational wireless concepts to independent research, trained him to help test and debug my Python-based LR-FHSS network simulator, and mentored him on writing his M.S. thesis.	Fall 2024
Arefa Haque, M.S. student, Wayne State University Guided her in implementing LR-FHSS on COTS devices and trained her to help debug and validate my GNU Radio gateway on a USRP B200, covering experimental design, hardware troubleshooting, and end-to-end validation.	Summer 2024

RESEARCH SUPPORT

My doctoral research has been supported by seven National Science Foundation (NSF) awards (CAREER-2306486, CNS-2301757, CNS-2306745, CNS-2211640, CNS-2601685, CNS-2602744, and CNS-1948365) and one Office of Naval Research (ONR) award (N00014-23-1-2151), with **Prof. Abusayeed Saifullah** as principal investigator and collaborations spanning more than eight universities.

PROFESSIONAL SERVICE

Journal Reviewer

• ACM Transactions on Cyber-Physical Systems (TCPS)	2025 – 2026
• ACM Transactions on Embedded Computing Systems (TECS)	2026
• ACM Transactions on Sensor Networks (TOSN)	2024
• Pervasive and Mobile Computing (Elsevier)	2023 – 2025

Conference Reviewer

- | | |
|---|-------------|
| • ACM/IEEE Intl. Conf. on Embedded Artificial Intelligence and Sensing Systems (SenSys) | 2024 – 2027 |
| • IEEE Real-Time Systems Symposium (RTSS) | 2023 – 2026 |
| • IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS) | 2022 – 2023 |
| • Intl. Conf. on Embedded Wireless Systems and Networks (EWSN) | 2023 – 2025 |
| • IEEE Intl. Conf. on Distributed Computing in Smart Systems and the IoT (DCOSS-IoT) | 2023 – 2026 |
| • IEEE Intl. Conf. on Sensing, Communication, and Networking (SECON) | 2026 |
| • IEEE Intl. Conf. on Embedded and Real-Time Computing Systems and Applications (RTCSA) | 2024 – 2025 |
| • International Conference on Networking, Systems and Security (NSysS) | 2025 |

PRIOR EXPERIENCE

Intelligent Transportation Systems Intern, Delhi Metro Rail Corporation Jun 2019 – Aug 2019
New Delhi, India

- Developed a CNN-based passenger-classification module for Delhi Metro station entry surveillance pipeline. Analyzed smart-card transactions using clustering and sequence mining to identify passenger travel patterns for transit planning. Gained hands-on experience with RFID, NFC, and EMI subsystems for automated fare collection.

Undergraduate Research Assistant, ADGITM, GGSIP University Sep 2018 – Feb 2019
Delhi, India

- Led a four-person team building a smart IoT water-level monitoring and control system with a custom multilevel resistive sensor, touch-switch inlet control, and a mobile app for remote monitoring.

Instrumentation and Data Analytics Intern, Indraprastha Gas Limited Jun 2018 – Aug 2018
New Delhi, India

- Developed Random Forest and XGBoost models to detect flow-meter faults caused by sensor aging, environmental drift, and calibration errors, improving detection accuracy by 17% over threshold-based checks. Delivered a predictive-maintenance interface to help field teams identify instrumentation faults.

TECHNICAL SKILLS

Programming:	Python, C, C++, MATLAB, SQL, R, Java, Bash
Wireless and SDR:	GNU Radio, USRP B200, COTS LoRa/LR-FHSS nodes and gateways
Learning and Simulation:	PyTorch, Pandas, NS-3
Systems and Tools:	Gurobi, Linux, Docker, Git, L ^A T _E X

REFERENCES

Dr. Abusayeed Saifullah (advisor)
Associate Professor, Dept. of Computer Science
The University of Texas at Dallas
abusayeed.saifullah@utdallas.edu
+1 (972) 883-4171

Dr. Haibo Zhang
Associate Professor
School of Computer Science and Engineering
UNSW Sydney, Australia
haibo.zhang@unsw.edu.au

Dr. Venkata Prashant Modekurthy
Assistant Professor, Dept. of Computer Science
University of Nevada, Las Vegas (UNLV)
prashant.modekurthy@unlv.edu
+1 (702) 774-3405

Dr. Marco Brocanelli
Assistant Professor, Computer Science and Engineering
The Ohio State University
brocanelli.1@osu.edu