Ufuk MUNCUK

Postdoctoral Research Associate
ECE Department at Northeastern University
Energy Efficient Circuits and Systems Group
Institute for NanoSystems Innovation

Research Interests

Ultra-low-power RF, analog, and mixed-signal integrated circuits; RF energy harvesting and wireless power transfer; reconfigurable intelligent surfaces (RIS) and holographic beamforming; physical-layer security and machine-learning-based jamming detection for IoT.

Education

2012–2019 **Ph.D. in Computer Engineering**, *Northeastern University*, Boston, MA, USA
Advisor: Prof. Kaushik R. Chowdhury. *GPA: 3.67/4.00*

2010–2012 **M.S. in Computer Engineering**, *Northeastern University*, Boston, MA, USA
Advisor: Prof. Kaushik R. Chowdhury. *GPA: 3.67/4.00*

2008–2009 **M.S. in Electrical & Electronics Engineering**, *Erciyes University*, Kayseri, Turkey
Advisor: Prof. Ibrahim Develi. *GPA: 4.00/4.00; graduated 1st in class.*

2004–2008 **B.S. in Electrical & Electronics Engineering**, *Firat University*, Elazig, Turkey
GPA: 3.40/4.00; graduated 3rd in class.

Academic Appointments and Experience

Sep. 2024 – Present **Postdoctoral Research Associate**, *Energy Efficient Circuits and Systems (EECS) Group, Department of Electrical and Computer Engineering, Northeastern University*, Boston, MA
Joined Prof. Aatmesh Shrivastava's group to pursue a focused research direction in ultra-low-power analog/RF circuits, IoT physical-layer security, and the integration of AI with RF hardware.

July 2020 – Aug. 2024 **Research Assistant Professor**, *Department of Electrical and Computer Engineering, Northeastern University*, Boston, MA
Independently led research projects on RF energy harvesting, wireless power transfer, and reconfigurable intelligent surfaces. Mentored graduate students, contributed to grant proposals, and authored multiple top-tier journal and conference publications.

July 2020 – Aug. 2024 **Associate Faculty**, *Institute for the Wireless Internet of Things (WIoT), Northeastern University*, Boston, MA
Affiliated research appointment supporting cross-cutting wireless-systems research within WIoT.

Sep. 2019 – July 2020 **Postdoctoral Research Associate**, *Genesys Lab, Northeastern University*, Boston, MA
RF energy harvesting and wireless power transfer.

2010 – 2019 **Graduate Research Assistant**, *Genesys Lab, Northeastern University*, Boston, MA
Doctoral and master's research on RF energy harvesting, multi-band rectifier design, and software-defined wireless charging.

Fall 2017 **Teaching Assistant**, *Northeastern University*, Boston, MA
Lab instructor for the graduate course *Mobile and Wireless Networking*.

Fellowships, Honors, and Awards

2022 Mass Innovation Network **Eddies Award** (Smart Living category), for wireless charging innovation.

2022 **Stevie Award**, International Business Awards.

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2019 **Best Paper Award**, IEEE Global Communications Conference (GLOBECOM), Hawaii, USA.

2018 **Best Paper Runner-up Award**, ACM Conference on Embedded Networked Sensor Systems (SenSys), Shenzhen, China.

2013 **Best Paper Award**, IEEE International Conference on Communications (ICC), Budapest, Hungary.

2015–2019 Stipended Graduate Research Assistantship, Northeastern University.

2008–2015 Turkey Ministry of Education Graduate Fellowship (full Ph.D. funding).

2008–2009 TUBITAK–BIDEP Graduate Fellowship (Scientific & Technological Research Council of Turkey).

Funding and Grant Activity

2024–Pres. **NSF RINGS** Award #2146754 – *ZCAR-based Wideband Spectrum Sensing for Next-Generation Wireless.* Technical contributor to Year 4 Annual Report and ongoing technical work.

2024–Pres. **DARPA Young Faculty Award** D23AP00173 (PI: A. Shrivastava). Technical contributor to ULP RF-security and adversarial jamming research lines (acknowledged in IEEE IoT-J 2026 and IEEE Comm. Mag. 2026).

2024–Pres. **NSF CCSS** grants CCSS-2125222 and CCSS-2144703 (PI: A. Shrivastava). Technical contributor to ULP analog/RF circuit research.

Publications

Submitted / Under Review

2026 V. Verma, **U. Muncuk**, K. S. Swaroop, and A. Shrivastava, *"Beyond Power-Blindness: Physical-Layer Correlation Asymmetry as a Signature for Selective ACK Jamming Detection,"* IEEE Communications Magazine, manuscript COMMAG-26-00320 (under revision).

Journal Articles and Magazines

2026 K. S. Swaroop, V. Verma, **U. Muncuk**, A. Mittal, and A. Shrivastava, *"An Adversarial Jamming Attack Detection Method Using Energy-Detection-Based Hardware for IoT Systems,"* *IEEE Internet of Things Journal*, vol. 13, no. 11, pp. 23010–23024, June 2026.

2026 U. Kumar, A. Mittal, **U. Muncuk**, and A. Shrivastava, *"Non-Iterative Square-Wave Modeling of Multistage CMOS Dickson Rectifiers for RF Energy Harvesting,"* *IEEE Open Journal of Circuits and Systems*, vol. 7, pp. 82–94, Feb. 2026.

2023 K. Li, M. Y. Naderi, **U. Muncuk**, and K. R. Chowdhury, *"MetaResonance: A Reconfigurable Surface for Holographic Wireless Power Transfer,"* *IEEE Trans. on Industrial Electronics*, vol. 70, no. 5, pp. 4682–4692, May 2023.

2022 S. G. Sanchez, G. R. Muns, C. Bocanegra, Y. Li, **U. Muncuk**, Y. Naderi, Y. Wang, S. Ioannidis, and K. R. Chowdhury, *"AirNN: Over-the-Air Computation for Neural Networks via Reconfigurable Intelligent Surfaces,"* *IEEE/ACM Trans. on Networking*, Dec. 2022.

2021 K. Li, M. Y. Naderi, **U. Muncuk**, and K. R. Chowdhury, *"iSurface: Self-powered Reconfigurable Intelligent Surfaces with Wireless Power Transfer,"* *IEEE Communications Magazine*, Aug. 2021.

2021 K. Li, **U. Muncuk**, M. Y. Naderi, and K. R. Chowdhury, *"iSense: Intelligent Object Sensing and Robot Tracking through Networked Coupled Magnetic Resonant Coils,"* *IEEE Internet of Things Journal*, vol. 8, no. 8, pp. 6637–6648, 2021.

2020 A. Trotta, **U. Muncuk**, M. Di Felice, and K. R. Chowdhury, *"Persistent Crowd Tracking Using Unmanned Aerial Vehicle Swarms: A Novel Framework for Energy and Mobility Management,"* *IEEE Vehicular Technology Magazine*, vol. 15, no. 2, pp. 96–103, June 2020.

2020 K. Li, **U. Muncuk**, M. Y. Naderi, and K. R. Chowdhury, *"SoftCharge: Software Defined Multi-device Wireless Charging over Large Surfaces," IEEE Journal on Emerging and Selected Topics in Circuits and Systems*, vol. 10, no. 1, pp. 38–51, March 2020.

2018 **U. Muncuk**, K. Alemdar, J. D. Sarode, and K. R. Chowdhury, *"Multi-band Ambient RF Energy Harvesting Circuit Design for Enabling Battery-less Sensors and IoTs," IEEE Internet of Things Journal*, vol. 5, no. 4, pp. 2700–2714, Aug. 2018.

2016 M. Swaminathan, F. S. Cabrera, J. S. Pujol, **U. Muncuk**, G. Schirner, and K. R. Chowdhury, *"Multi-path Model and Sensitivity Analysis for Galvanic Coupled Intra-body Communication through Layered Tissue," IEEE Trans. on Biomedical Circuits and Systems*, vol. 10, no. 2, 2016.

2015 L. Chen, J. Warner, P. L. Yung, D. Zhou, W. Heinzelman, I. Demirkol, **U. Muncuk**, K. R. Chowdhury, and S. Basagni, *"REACH2-Mote: A Range Extending Passive Wake-up Wireless Sensor Node," ACM Trans. on Sensor Networks*, vol. 11, no. 4, Dec. 2015.

2012 P. Nintanavongsa, **U. Muncuk**, D. R. Lewis, and K. R. Chowdhury, *"Design Optimization and Implementation for RF Energy Harvesting Circuits," IEEE Journal on Emerging and Selected Topics in Circuits and Systems*, vol. 2, no. 1, March 2012.

Conference Papers and Book Chapters

2021 K. Alemdar, D. Varshney, S. Mohanti, **U. Muncuk**, and K. R. Chowdhury, *"RFClock: Timing, Phase and Frequency Synchronization for Distributed Wireless Networks,"* ACM MobiCom, New Orleans, USA, Oct. 2021.

2019 Y. Naderi, **U. Muncuk**, K. R. Chowdhury, *"Next-Generation Software-Defined Wireless Charging System,"* In: Ammari H. (eds) *Mission-Oriented Sensor Networks and Systems: Art and Science*, Studies in Systems, Decision and Control, vol. 164. Springer, Cham, 2019.

2019 K. Li, **U. Muncuk**, M. Y. Naderi, and K. R. Chowdhury, *"SoftSense: Collaborative Surface-based Object Sensing and Tracking Using Networked Coils,"* IEEE GLOBECOM, Hawaii, USA, 2019. *(Best Paper Award.)*

2018 H. Truong, S. Zhang, **U. Muncuk**, P. Nguyen, N. Bui, A. Nguyen, Q. Lv, K. Chowdhury, T. Dinh, and T. Vu, *"CapBand: Battery-free Successive Capacitance Sensing Wristband for Hand Gesture Recognition,"* ACM SenSys, Shenzhen, China, Nov. 2018. *(Best Paper Runner-up.)*

2018 K. Sankhe, **U. Muncuk**, M. Y. Naderi, and K. R. Chowdhury, *"Talking When No One is Listening: Piggybacking City-scale IoT Control Signals Over LTE,"* IEEE INFOCOM, Hawaii, USA, April 2018.

2016 P. Nguyen, **U. Muncuk**, A. Ashok, K. R. Chowdhury, M. Gruteser, and T. Vu, *"Battery-Free Identification Token for Touch Sensing Devices,"* ACM SenSys, Stanford, CA, USA, Nov. 2016.

2016 **U. Muncuk**, S. Mohanti, K. Alemdar, M. Y. Naderi, and K. R. Chowdhury, *"Software-defined Wireless Charging of Internet of Things using Distributed Beamforming,"* Live Demo, ACM SenSys, Stanford, CA, USA, Nov. 2016.

2016 M. Swaminathan, **U. Muncuk**, and K. R. Chowdhury, *"Tissue Safety Analysis and Duty Cycle Planning for Galvanic Coupled Intra-body Communication,"* IEEE ICC, Kuala Lumpur, Malaysia, 2016.

2016 M. Swaminathan, **U. Muncuk**, and K. R. Chowdhury, *"Topology Optimization for Galvanic Coupled Wireless Intra-body Communication,"* IEEE INFOCOM, San Francisco, USA, 2016.

2013 L. Chen, S. Cool, H. Ba, W. Heinzelman, I. Demirkol, **U. Muncuk**, K. R. Chowdhury, and S. Basagni, *"Range Extension of Passive Wake-up Radio Systems through Energy Harvesting,"* IEEE ICC, Budapest, Hungary, June 2013. *(Best Paper Award.)*

Patents

2025 K. Chowdhury, **U. Muncuk**, Y. Naderi, *"Programmable Intelligent Surfaces with AI-enabled Autonomous Sensing, Charging, Computing, and Networking,"* US20250055321A1.

2025 K. Chowdhury, Y. Naderi, **U. Muncuk**, *"Method and Apparatus for Over-the-Air Neural Networks via Reconfigurable Intelligent Surfaces,"* US12412992B2.

2025 K. Chowdhury, **U. Muncuk**, Y. Naderi, *"Self-powered Reconfigurable Intelligent Surfaces with Wireless Power Transfer,"* US12374931B2.

2024 K. Chowdhury, **U. Muncuk**, Y. Naderi, *"Method and Apparatus for Software Defined Radio with Timing, Phase, and Frequency Synchronization,"* US12028824B2.

Selected Research Projects

2024–Pres. **Selective ACK Jamming Detection for IEEE 802.15.4 IoT**
Co-designed an O-QPSK/DSSS PHY simulation framework with Rician fading, AGC, and 5-tap MMSE equalization; developed a 46-feature Random Forest classifier achieving 91.93% detection accuracy (AUC 0.9621) and 100% recall at JSR$\geq$0 dB. Deployed inference on an ESP32 ARM Cortex-M4 within 61% of the 802.15.4 inter-frame budget.

2024–Pres. **Ultra-Low-Power RSSI Front-End and Energy-Detection-Based Security**
Contributed to the system modeling and over-the-air validation of a 6 nW direct-RF-to-digital RSSI circuit (65 nm CMOS) used as a learning baseline for deceptive and periodic jamming detection; method achieved 96.4% measurement accuracy with 11.2 nW total inference power.

2024–Pres. **ZCAR: LO-Less Wideband Active RF Resonator for Spectrum Sensing (65 nm CMOS)**
Co-developed the Zero Controlled Active Resonator (ZCAR), a continuous-time, LO-less RF filter that exploits a tunable right-half-plane (RHP) zero for Q-enhancement, eliminating the multi-mW LO/PLL of switched-capacitor N-path filters. Contributions span the theoretical framework (mathematical derivation of Q-invariance under bias tuning, Volterra-series large-signal linearity analysis, and absolute stability bounds), the 65 nm CMOS implementation, and silicon validation. The fabricated prototype (core area 0.00135 mm^2) achieves continuous resonance tuning from 0.4 to 8 GHz, $Q = 27.5$ at 4.4 GHz, 22.7 dBV output gain at 7.2 GHz, and IP1dB of -40 dBm, all within a 3.6–4 mW power budget. Includes an integrated zero-static-power RF energy detector for closed-loop large-signal stability monitoring. Supported by NSF RINGS Award #2146754.

2019–2024 **MetaResonance and Software-Defined Wireless Charging**
Lead engineer for a multi-coil resonant wireless charging platform that converts existing surfaces into contactless multi-device charging pads. Achieved $Q > 120$ tuned coil arrays and >85% transfer efficiency.

2019–2024 **Magnetic Surface-based Object Sensing and Tracking (iSense)**
Designed and implemented a dual-coil inductive low-power contact-less sensing system based on nested coils, enabling joint object tracking and multi-device wireless charging.

2019–2024 **Qi-Compliant Wireless Charging Surface for UAVs**
Initiated concept ideation of surface-based UAV charging; designed multi-coil Tx/Rx components and over-voltage protection mechanism.

2017–2019 **Multi-band Ambient RF Energy Harvesting for Self-powered Sensors**
Designed and implemented a single multi-band, adjustable RF-EH circuit harvesting from LTE 700 MHz, GSM 850 MHz, and ISM 900 MHz, demonstrating up to 45% efficiency and powering a TI eZ430-RF2500 sensor at multiple urban locations.

2016–2019 **Software-Defined Distributed Energy Beamforming**
Led the prototype of a wireless charging system using distributed energy beamforming across multiple uncoordinated SDR transmitters, enabling constructive net energy delivery to a target receiver.

2013–2016 **Wake-Up Receiver using RF Energy Harvesting**
Studied cost-effective and long-range solutions for range-based and directed wake-up of passive sensor nodes.

2010–2012 **Dual-Stage CMOS Rectifier for RF Energy Harvesting**
Developed a dual-stage (7-/10-stage) RF energy harvesting circuit prototype delivering 100% improvement over prior designs in the −20 dBm to +7 dBm input power range.

Advising and Mentorship

Ph.D. **Vikram Verma** (Ph.D., Northeastern). Co-mentor on selective ACK jamming detection, MMSE equalization, and the IEEE Comm. Mag. 2026 manuscript.

Ph.D. **K. Shabd Swaroop** (Ph.D., Northeastern). Co-mentor on the energy-detection-based RSSI hardware and IEEE IoT-J 2026 publication.

Ph.D. **Utkarsh Kumar** (Ph.D., Northeastern). Co-mentor on multistage CMOS Dickson rectifier modeling (IEEE OJCAS 2026).

Professional Service

Reviewer IEEE Transactions on Networking; IEEE Internet of Things Journal; IEEE Transactions on Wireless Communications; IEEE Communications Magazine; IEEE Transactions on Vehicular Technology.

Professional Memberships

Member, IEEE; IEEE Communications Society (ComSoc); IEEE Circuits and Systems Society (CAS); IEEE Microwave Theory and Techniques Society (MTT-S). Member, ACM.

Technical Skills

Programming MATLAB, Python, C/C++, GNU Radio, LaTeX; embedded ML with TensorFlow Lite Micro on ESP32 / ARM Cortex-M4.

EDA / Design Cadence Virtuoso, Keysight ADS, Ansys HFSS/Maxwell, LTspice, Altium Designer, Mentor Graphics PADs.

RF / Hardware Full RF laboratory characterization: VNA, spectrum analyzer, signal generator, oscilloscope; USRP X310/N210/B210/B200mini; multi-band RF energy-harvesting and wireless-power prototyping.

References

Aatmesh Shrivastava, Ph.D., *Associate Professor, ECE, Northeastern University*
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Kaushik R. Chowdhury, Ph.D., *Professor, Chandra Family Endowed Distinguished Professorship in Electrical and Computer Engineering 2, NThe University of Texas at Austin*
kaushik@utexas.edu