Harshvardhan Uppaluru

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Research Direction

My research addresses the co-design of intelligent algorithms and neuromorphic hardware for autonomous and resource-constrained systems - spanning multi-agent coordination, and the modeling and performance analysis of memristor-based neuromorphic systems for Edge AI. This work bridges neuroscience-inspired computing with real-world autonomous systems, contributing to scalable intelligent agents. Alongside this, I am establishing a research direction in machine learning and data science for biomedical applications and sports analytics, areas of growing national importance.

Education

- **Doctor of Philosophy (Ph.D.) in Aerospace Engineering** — August 2023
  University of Arizona (UoA), Tucson, Arizona, *Advisor: Dr. Hossein Rastgoftar*

- **Master of Engineering (M.E.) in Robotics Engineering** — May 2018
  University of Maryland (UMD), College Park, Maryland

- **Bachelor of Technology (B.Tech.) in Mechatronics Engineering** — May 2015
  SRM University, Chennai, Tamil Nadu, India

Professional and Research Experience

- **Engineering Researcher I** — February 2026
  IMPACT Lab, The University of Alabama (UA), *Advisor: Dr. Jinhui Wang*

- **Co-Advisor** — August 2025
  University of South Alabama (USA) Robotics Club

- **Postdoctoral Fellow** — August 2025
  IMPACT Lab, University of South Alabama (USA), *Advisor: Dr. Jinhui Wang*

- **Graduate Research Assistant** — August 2023
  SMART Lab, University of Arizona (UoA), *Advisor: Dr. Hossein Rastgoftar*

Thesis

1. **H. Uppaluru**. "Continuum Deformation Based Autonomy: Approaches to Multi-Agent Systems", *University of Arizona*, 2023.

Journal Publications

1. M.M.H. Tanim, Z. Templin, **H. Uppaluru**, J. Wang, K.Y. Cheong, F. Zhao. "Honey-CNT Memristive Artificial Synaptic Device for Sustainable Neuromorphic Computing System", *Nanotechnology Reviews*, 2026.

2. **H. Uppaluru**, M.S.M. Jiban, S.Z. Riam, F. Zhao, J. Wang. "Performance Analysis and Optimization of Fructose Memristor-Based Neuromorphic Systems", *IEEE Journal on Emerging and Selected Topics in Circuits and Systems (JETCAS)*, 2026.

3. J. Wang, F. Zhao, M.R. Khan, M.M.H. Tanim, Z. Templin, **H. Uppaluru**. "Honey-ReRAM Enabled Sustainable Edge AI System for IoT Applications", *IEEE Access*, 2025.

4. **H. Uppaluru**, S. Kunwar, A. Chen, J. Wang. "Parallel Interface-type (IT) Memristor Architecture with Non-Linear Mapping and Carbon Footprint Estimation for Neuromorphic Computing Systems", *Transactions on Computers (TC) Special Issue: Carbon Efficient Computer Architectures and Systems*, 2025.

5. **H. Uppaluru**, Z. Templin, M.R. Khan, M.O. Faruque, F. Zhao, J. Wang. "256-level Honey-Based In-Memory Neuromorphic System", *Electronics Letters (EL)*, 2024.

6. A.E. Asslouj, **H. Uppaluru** , M. Ramezani, E. Atkins, H. Rastgoftar. "A Fixed Air Corridor Model for UAS Traffic Management in Urban Areas", *IEEE Transactions on Aerospace and Electronic Systems (TAES)*, 2024.

7. **H. Uppaluru**, H. Emadi, H. Rastgoftar. "Resilient Multi-UAS Coordination Using Cooperative Localization", *Aerospace Science and Technology (AST)*, 2022.

Conference Publications

1. S. Digman, **H. Uppaluru**, J. Wang, S. Wu. "Edge AI Based Real-Time Glucose Prediction", *IEEE SoutheastCon*, 2026.

2. **H. Uppaluru**, S.Z. Riam, J. Wang, M.S.M. Jiban, F. Zhao. "Neuromorphic Computing Systems Based On Nonlinear Fructose Memristors", *Non-Volatile Memory Technology Symposium (NVMTS)*, 2025.

3. **H. Uppaluru**, Z. Templin, S.Z. Riam, F. Zhao, J. Wang. "Carbon Efficiency of Natural Organic Honey-Memristor Based Neuromorphic Computing", *Great Lakes Symposium on VLSI (GLSVLSI)*, 2025.

4. **H. Uppaluru**, M.M.H. Tanim, M.O. Faruque, M.R. Khan, Z. Templin, F. Zhao, J. Wang. "Variation-Aware Non-linear Mapping for Honey-Memristor Based Neuromorphic System", *International Conference on Neuromorphic Systems (ICONS)*, 2024.

5. **H. Uppaluru**, M. Ghufran, H. Rastgoftar. "Fluid Flow Modeling and Experimental Evaluation of Unscrewed Aerial System Coordination", *International Conference on Unmanned Aircraft Systems (ICUAS)*, 2024.

6. **H. Uppaluru**, M. Ghufran, A.E. Asslouj, H. Rastgoftar. "Drones Practicing Mechanics", *International Conference on Unmanned Aircraft Systems (ICUAS)*, 2023.

7. **H. Uppaluru**, H. Rastgoftar. "Multi-Layer Continuum Deformation Optimization of Multi-Agent Systems", *International Federation of Automatic Control World Congress (IFAC)*, 2023.

8. **H. Uppaluru**, H. Rastgoftar. "Deep Continuum Deformation Coordination and Optimization with Safety Guarantees", *American Control Conference (ACC)*, 2023.

9. **H. Uppaluru**, H. Rastgoftar. "A Physics-Based Data-Driven Approach for Finite Time Estimation of Pandemic Growth", *Modeling, Estimation and Control Conference (MECC)*, 2022.

10. **H. Uppaluru**, X. Liu, H. Emadi, H. Rastgoftar. "A Continuous-Time Optimal Control Approach to Congestion Control", *European Control Conference (ECC)*, 2022.

11. H. Emadi, **H. Uppaluru**, H. Ashrafiuon, H. Rastgoftar. "Collision-Free Continuum Deformation Coordination of a Multi-Quadcopter System Using Cooperative Localization", *European Control Conference (ECC)*, 2022.

12. H. Emadi, **H. Uppaluru**, H. Rastgoftar. "A Physics-Based Safety Recovery Approach for Fault-Resilient Multi-Quadcopter Coordination", *American Control Conference (ACC)*, 2022.

POSTER PRESENTATIONS

1. **H. Uppaluru**, A. Chen, S. Kunwar, M.S.M. Jiban, S.Z. Riam, F. Zhao, J. Wang. "Performance Analysis and Optimization of Fructose - Memristor Based Neuromorphic Systems", *Energy Consequences of Information Workshop* (ECI), 2025.

2. **H. Uppaluru**, M.S.M. Jiban, S.Z. Riam, F. Zhao, J. Wang. "Performance Analysis and Optimization of Fructose - Memristor Based Neuromorphic Systems", *IEEE Non-Volatile Memory Technology Symposium* (NVMTS), 2025.

3. S. Digman, I.L.O. Arnold, K. Mooney, **H. Uppaluru**, N. Gong, S. Wu, J. Wang. "AI Models on Edge Devices with Accelerator", *ACM/IEEE International Conference on Connected Health: Applications, Systems and Engineering Technologies* (CHASE), 2025.

4. **H. Uppaluru**, S. Kunwar, A. Chen, J. Wang. "Interface Memristor Based Neuromorphic Systems", *International Conference on Neuromorphic Systems* (ICONS), 2024.

5. S.C. Johnson, **H. Uppaluru**, W. Oswald, C.M. Francis, N. Gong, S. Leavesley, T. Rich. "Characterization of Agonist-Induced Ca^{2+} Signals in Human Airway Smooth Muscle Cells Using Excitation Scanning Hyperspectral Imaging and Image Analysis Approaches", *American Society for Pharmacology and Experimental Therapeutics (ASPET)*, 2024.

UNDER PREPARATION AND PREPRINTS

1. S.Z. Riam, I.L.O. Arnold, K. Mooney, S. Haq, **H. Uppaluru**, N. Gong, J. Wang. "Survey and Benchmarking of Carbon Tracking Tools for AI Workloads".

2. M. Romano, **H. Uppaluru**, H. Rastgoftar, E. Atkins. "Quadrotor Formation Flying Resilient to Abrupt Vehicle Failures via a Fluid Flow Navigation Function".

PROFESSIONAL SERVICES

- Great Lakes Symposium on VLSI (GLSVLSI) Poster Session Chair, Session Chair, Reviewer   2025

- International Conference on Unmanned Aircraft Systems (ICUAS) Associate Editor   2025

- Design Automation Conference (DAC) Reviewer   2024, 2025, 2026

- International Conference on Physical Assurance and Inspection of Electronics (PAINE) Reviewer   2024

- International Conference on Neuromorphic Computing Systems (ICONS) Session Chair   2024

- Great Lakes Symposium on VLSI (GLSVLSI) Program Committee Member   2024

- International Conference on Unmanned Aircraft Systems (ICUAS) Reviewer   2024

- IEEE Transactions on Aerospace and Electronic Systems (TAES) Reviewer   2022

Proposals and Grants

1. *Seed Award for Researchers at the Junior Level (SARJ) - $15000*   Aug 2025

2. *Center for Integrated Nanotechnologies (CINT) User Proposal*   Aug 2024 - Feb 2026

Awards and Fellowships

- Post-doc Activities Enhancement Travel Award   Jun 2025

- Post-doc Activities Enhancement Travel Award   Jun 2024

- Graduate Professional and Student Council (GPSC) Travel Award   Jun 2023

- Dean's Graduate Fellowship Award   Jul 2021

Teaching Experience

- **Instructor**

  AME455: Control System Design, UoA   Summer 2023

- **Teaching Assistant**   *with Prof. Hossein Rastgoftar, Prof. Eniko Enikov*

  AME455: Control System Design, UoA   Spring 2022, Fall 2022, Spring 2023

Outreach

- *Neuromorphic Computing*   Nov 2024

  Introduced the research area to 50+ high school students as part of the Discover Engineering Day at the University of South Alabama.

- *Introduction to Robotics*   Jun 2024

  Presented to 20+ high school teachers and undergraduate students as part of Edge AI Summer Program at the University of South Alabama.

Mentoring/Advising

- Sean Digman   Aug 2024 - Dec 2025

- Shah Zayed Riam - *Currently Ph.D. student at UA*   Aug 2024 - Feb 2026

- Isaac Arnold - *Currently Ph.D. student at UA*   May 2024 - Feb 2026

- Kyle Mooney - *Currently Ph.D. student at UA*   Sept 2023 - Feb 2026

- Mohammed Rafeeq Khan   Sep 2023 - Sep 2025

- Md Omar Faruque   Sep 2023 - Aug 2025

- Mohammad Ghufran   Aug 2022 - Aug 2023

- Jack Hughes   Jan 2023 - Aug 2023

- Aeris El Asslouj   Mar 2022 - Aug 2022

Research Publicity

- **Drones Practicing Mechanics**, University of Arizona, College of Engineering, 2022.