

Ibrahim M. Eshera

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Citizenship: USA

Education

Ph.D., Electrical Engineering, Virginia Polytechnic Institute and State University (Virginia Tech)
Thesis: Robotics, Bio-Sonar, Signal Processing, Machine Learning

Master of Engineering Administration (MEA), Virginia Polytechnic Institute and State University (Virginia Tech)

M.S., Electrical Engineering, Virginia Polytechnic Institute and State University (Virginia Tech)

B.S., Electrical Engineering, University of Maryland
College Park Scholars, Honors Program — Science, Technology, and Society
Dean's List Academic Honors

Coursework

Advanced Machine Learning, Deep Learning, Data Analytics, Statistics in Research, Operations Research, Engineering Program Project Management, Leadership in Tech-Based Organizations, Engineering Entrepreneurship, Quality Management

Research & Publications

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- **Eshera, I.**, & Müller, R. (2025). "Deep Learning Methods for Biomimetic Doppler-Enhanced Spectrotemporal Analysis of Clutter Echoes" *Advanced Intelligent Systems* (manuscript submitted).
 - **Eshera, I.**, & Müller, R. (2025). "Impact of Biomimetic Pinna Shape Variation on Clutter Echoes: A Machine Learning Approach" *Advanced Intelligent Systems*, doi:10.1002/aisy.202500442.
 - **Eshera, I.**, Shelton, C., & Das, S. (2025). "Methods and Systems for Classifying Vehicles as Electric or Nonelectric Based on Audio" U.S. Patent No. 18/398,674.
 - **Eshera, I.**, Shelton, C., & Das, S. (2025). "Methods and Systems for Determining a Quantity of Fuel Dispensed at a Fueling Station Based on Audio." U.S. Patent No. 18/389,979.
 - **Eshera, I.**, Lagad, S. V., & Müller, R. (2023). "Investigating the impact of biomimetic pinna shape variations on clutter echoes received from natural environments." *The Journal of the Acoustical Society of America (JASA)*, 154. A21-A21.
 - Müller, R., Chakrabarti, S., **Eshera, I.**, Lagad, S. V., Wang, R., & Zhang, L. (2021). "Autonomy, soft-robotics, deep learning, and bat biosonar." *The Journal of the Acoustical Society of America (JASA)*, 150(4), A325-A325.
 - Lagad, S. V., **Eshera, I.**, Chakrabarti, S., & Müller, R. (2021). Development of a tension-controlled soft-robotic actuation system for a biomimetic bat robot. *The Journal of the Acoustical Society of America (JASA)*, 150(4), A324-A324.
 - Knoll, J., **Eshera, I.**, Shawky, M., DiMarino, C., Ghandi, R., ... & Buttay, C. (2021). Characterization of 4.5 kV Charge-Balanced SiC MOSFETs. In *2021 IEEE Applied Power Electronics Conference and Exposition (APEC)* (pp. 2217-2223). IEEE.

Work Experience

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- Virginia Tech, Bio-Inspired Science & Technology Center (BIST), Research Assistant* August 2020 — Present
- Introduced ML to BIST by formulating, developing, and deploying machine learning methods for pattern recognition, target detection, and system state estimation in dynamic environments; integrating a biomimetic robotic sonar prototype and portable data-collection system into the ML pipeline (showcased to the U.S. Navy) — see *Research & Publications*.
 - Built ML-ready datasets by designing and implementing novel experimental platforms and end-to-end data collection pipelines combining embedded systems, robotics, and sensors to capture complex datasets for autonomous systems research.
 - Directed a \$500,000 research budget and led an Agile interdisciplinary team (20+ wage undergraduate researchers/year) across electrical, mechanical, computer engineering, and computer science; managed recruiting, system design, task assignment, prototyping, minimum viable product delivery, and deployments; and oversaw end-to-end development of a biomimetic robotic sonar prototype and portable data-collection system: balancing technical leadership (hardware, embedded systems integration, machine learning) with administrative management (budgeting, procurement, sponsor coordination & presentation).
- Bosch Research, Center for Artificial Intelligence (BCAI), Machine Learning Research Intern* April 2023 — Sep 2023
- Collaborated in partnership with a Bosch business division to assess an automated valet parking system, pinpointed areas for improvement within the system, and suggested AI-based solutions to address the challenges effectively.
 - Worked with Vision-Language Foundation Models (CLIP, GLIP, SegmentAnything) with limited dataset in an effort to deploy a scalable and robust solution for object detection for an autonomous valet parking system.
 - Deployed fine-tuning methods and model ensemble averaging for a Vision-Language Models paired with Segment Anything for semantic segmentation and obstacle detection and avoidance.

Bosch Research, AudioAI & AIoT, Machine Learning Engineer Intern

May 2022 — April 2023

- Worked with audio-based hardware to develop various technology and intellectual property for acoustic-based anomaly detection, scene recognition, and event detection.
- Developed end-to-end hardware and software system to generate high-quality labeled audio and visual data for various downstream tasks, allowing highly niche datasets to be created for data-driven approaches to machine learning problems.
- Trained an audio deep learning classifier to detect and identify electric vehicles for vehicle counting, filling a void in a business use-case, inventor on issued U.S. Patent No. 18/398,674.
- Developed, demoed, and deployed audio hardware setup, collection, and audio machine learning classifier at a customer airport for remote sensing of refueling operations, enabling customer to monitor fuel consumption and usage on-site that was otherwise unknown and unquantifiable, inventor on issued U.S. Patent No. 18/389,979.

Virginia Tech, Center for Power Electronics Systems (CPES), Research Assistant

May 2019 — May 2020

- Designed and developed Double Pulse Test (DPT) circuit board and experiment set-up to characterize high voltage switching devices up to 6kV.
- Characterized and published results for 4.5 kV SiC Charge Balanced MOSFETs at room temperature both statically and dynamically, in partnership with General Electric (GE).

Ford Motor Company, Research & Advanced Engineering, Intern

Summer 2018

- Developed tools in OpenGL and C++ to aid in Autonomous Vehicle and Driver Assist Technologies (DAT).
- Integrated DAT features from LiDAR and radar sensors, such as Lane Detection, Path Planning, and Pedestrian Detection into real-time overlay of onboard camera feed.

Textron Aviation, Avionics & Electrical Systems, Intern

Summer 2017

- Developed and prototyped system in a cross-disciplinary team for the Cessna Citation Longitude that detects and warns ground handlers and pilots of obstructions and dangers in the path of the aircraft while taxiing.
- Developed a LiDAR system to create a 3D point map of any space for use in autonomous tug and taxi operations.
- Represented Engineering Department in intern showcase and presented minimum viable product to CEO & ELT.

Bell Helicopter, Flight Technology Research & Development, Intern

Summer 2016

- Worked in OpenGL to update software written in outdated Performer code to OpenSceneGraph for an essential component of V-22 simulation software.
- Authored documentation for existing software, clarifying how software functioned and outlining improvements.

United States Army Research Laboratory, Sensors & Electronics Division, Intern

Summer 2015

Honors, Awards, and Certifications

Virginia Space Grant Consortium (VSGC), Fellowship (\$6,000)	2025
Virginia Tech, Graduate & Professional Student Senate Travel Grant (\$500)	2025
Virginia Commonwealth Cyber Initiative (CCI), Cyber Innovation Scholar (\$2,000/yr)	2024, 2025
VDOT AI and Machine Learning Traffic Application Pitch Competition, Finalist	2024
40th Annual Virginia Tech Research Symposium and Exposition, Best Presentation Award (\$500)	2024
185th Meeting of the Acoustical Society of America, Best Conference Presentation Award (\$1,000)	2023
Acoustical Society of America, Graduate Student Travel Award (\$1,000)	2023
Virginia Tech, Pratt International Travel Grant (\$500)	2023
University of Maryland A. James Clark School of Engineering, Merit Scholarship (\$15,000)	2016 — 2019
Cessna Training Academy, FAA Private Pilot Certificate	2017 — Present