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

Skills

Python, MATLAB, C, PyTorch, Java, Altium, Ansys Q3D, Ansys IcePack, LTSpice, TensorFlow, LiDAR, OpenGL, C++, Git, Linux, UNIX, Raspberry Pi, Arduino, SysML, CAD, Fusion360, Verilog, Adobe Creative Suite CS6

Honors, Awards, and Certifications

Virginia Space Grant Consortium (VSGC) Fellowship ($6,000)	2025
Virginia Commonwealth Cyber Initiative (CCI), Cyber Innovation Scholar ($2,000)	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
Benjamin A. Gilman International Scholarship Program (Declined)	2018
Dept. of Electrical & Computer Engineering Merit Scholarship, A. James Clark School of Engineering ($15,000)	2016 — 2019
Cessna Training Academy, FAA Private Pilot Certificate	2017 — Present

Research & Publications

- **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)*.
- **Eshera, I.**, Shelton, C., & Das, S. (2023). "System and method for automatic data collection, labeling, and classification of electric vehicles from a microphone array." U.S. Patent Application Filed.
- **Eshera, I.**, Shelton, C., & Das, S. (2023). "A novel system and method for measuring fuel-flow and refueling operation status using a microphone array and machine learning." U.S. Patent Application Filed.
- 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, June). 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

Virginia Tech, Bio-Inspired Science & Technology Center (BIST), Research Assistant — *August 2020 — Present*

- Created novel laboratory setup for data collection of large uncorrelated datasets of sonar echoes utilizing it for numerous downstream sonar sensing tasks.
- Utilized setup to develop, train, and justify an acoustic deep learning model that can identify the physical state of a time-varying receiver based on clutter echoes in a complex natural environment.
- Utilized setup to collect data for comparison between simulated and measured bio-sonar beam patterns and transfer functions for comparison and to justify a deep learning approaches to simulating and accurately estimating beam patterns for a given receiver configuration.
- Developing deep learning models utilizing transfer learning to detect and localize targets embedded in cluttered environments through an experimental testing setup.

- Developed Linear Time-Varying (LTV) system to filter time and frequency-varying sonar echoes for further integration with Deep Reinforcement Learning paradigms for a Frequency Modulated (FM) Echo Dataset to actuate a soft robotic bio-sonar in order to optimize various possible ear positions.
- Lead graduate researcher on a Navy-funded project to develop a prototype of fully autonomous drone by mimicking bat behavior via the integration of machine learning algorithms for path planning and autonomous space protection.
- Directing and guiding a research team comprised of over twenty electrical, mechanical, and aerospace undergraduate and graduate students to research and develop a bio-mimetic robot sonar sensor for integration with drone.

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 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 a 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 (patent pending).
- Developed 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 (patent pending).
- Filed two company invention reports containing intellectual property of the previously mentioned technologies developed, currently pending United States Patent approval.

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).
- Researched power electronics packaging for next generation semiconductor material, Gallium Oxide, in partnership with the National Science Foundation (NSF).

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.
- Represented Engineering Department in Intern Showcase and presented prototype to CEO & ELT.
- Individually developed a LiDAR system to create a 3D point map of any space for use in autonomous tug and taxi operations.

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*

- Researched linearity characteristics of millimeter-wave GaN power amplifiers in order to maximize efficiency of input signals without altering the signal.
- Analyzed linearity characterization system to correct errors, debug software, and optimize user experience, thus reducing the total time to conduct a test from over 90 minutes to less than 20 minutes.
- Authored comprehensive documentation so that other labs may conduct tests for their devices using the system.