Adnan Abdullah

PhD Student & Graduate Research Assistant, RoboPI Lab, University of Florida

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Professional Summary

PhD researcher in robotics and autonomous systems with hands-on experience in developing perception and navigation pipelines for GPS-denied, low-light, and sensor-degraded environments. My work focuses on audio-visual perception and scene representation for advancing autonomy in field robotics using ROS-based pipelines; validated in digital twin simulations and in real-world settings with AUV/ASV/ROV platforms. Proficient in ROS, Python, PyTorch, and Linux. Strong foundation in core robotics principles: kinematics, locomotion, state estimation, and path planning.

Education

• PhD in Electrical and Computer Engineering, University of Florida | Jan 2023 – Present
Advisor: Dr. Md Jahidul Islam | Concentration: Field Robotics & AI | GPA: 3.96/4.00
• Bachelor of Science in Electrical & Electronic Engineering, Bangladesh University of Engineering and Technology | Feb 2016 – Feb 2021 | GPA: 3.73/4.00

Technical Skills

• Programming & ML: Python (PyTorch, OpenCV, Pandas), CUDA, MATLAB
• Robotic Software: ROS1 Noetic, ROS2 Galactic/Humble, Gazebo, RViz, FoxGlove
• Robot Platforms: BlueROV2, BlueBoat, Aqua2, NemoSens, ChasingM2, CavePI & NemeSys (custom)
• Edge-AI Devices: Nvidia Jetson Nano, Orin Nano, Xavier NX
• SBCs & HW: Raspberry Pi 4/5, Arduino, Pixhawk, DAD Board, IMU, LiDAR, Hydrophone
• Tools: Docker, Conda, Git, VS Code, Ubuntu Linux, LaTeX

Work Experience

Graduate Research Assistant, RoboPI Lab, University of Florida | Jan 2023 – Present
• Designed **Ego-to-Exo** and **EgoExo++**: AR-based teleoperation systems for ROVs. Introduced SLAM-driven egocentric-to-exocentric visualization that improves operator spatial awareness in confined environments, validated through user studies (SUS score: 77.5) and cave deployments.
• Introduced **CaveSeg**: The first annotated underwater cave image dataset (13 classes) and a real-time transformer-based segmentation pipeline for AUV navigation, matching Swin-T accuracy with <50% parameters and 1.8x faster inference.
• Developed **CavePI** and **NemeSys**: Custom AUVs and their digital twins for semantic-guided underwater cave exploration, magnetoelectric communication, and infrastructure surveillance. Demonstrated full autonomy by integrating perception, planning, and control on edge-AI devices.
• Identified acoustic vulnerabilities of **underwater data centers**: Proposed ROV agent-based surveillance systems. Formulated the first robotic sensing pipeline to detect and localize adversarial acoustic agents, achieving sub-meter localization accuracy and over 90% success rates, with convergence times nearly halved compared to baseline methods.
• Proposed **Word2Wave**: A dynamic mission programming interface for AUVs using a small language model (T5-Small). Designed a novel language-to-mission mapping pipeline with custom command grammars, prompt-engineered training data, and real-time mission visualization, reducing AUV mission programming time by over 90% compared to commercial interfaces.
• Developed **VL-Explore**: A vision-language navigation pipeline for simultaneous exploration and target discovery using CLIP. Enabled zero-shot navigation from monocular vision, outperforming classic exploration algorithms without requiring prior maps, candidate images, or pre-built graphs.

Undergraduate Research Student, DSP Research Lab, BUET | May 2019 – Dec 2020
• Proposed a DL network for motion-artifact suppression in PPG signals for heart-rate estimation.

Marine Robotic Field Operations & Collaborations

• **Underwater Cave Exploration**: Conducted tens of human-robot cooperative missions in underwater caves and grottos in Florida. Curated the first pixel-annotated cave image dataset for visual servoing and paved the way for full autonomy in cave research. (Colab: Autonomous Field Robotics Lab, University of South Carolina | Apr 2023 – Present)

• **Robotic Platform for Water Quality Monitoring**: Designed a compact, low-power sensing module with six physico-chemical sensors (DO, pH, TDS, turbidity, temperature, pressure) integrated into ASV/ROV platforms, enabling dense, low-labor waterbody profiling in Falling Creek Reservoir, Vinton, Virginia. (Colab: VTech Center for Ecosystem Forecasting | Jun 2023)

• **Seabed Survey and Subsea Structure Mapping**: Conducted reef and shipwreck mapping using the NemoSens AUV in the Gulf of Mexico, generating high-resolution seabed reconstructions to advance bathymetric surveying and inspection. (Colab: FSU Coastal and Marine Lab | Mar 2024)

• **Glider Trajectory Estimation**: Developed and evaluated a trajectory forecasting model for Slocum gliders using live-streamed data from Delaware Bay area, Atlantic Ocean, accounting for vehicle dynamics and forecasted ocean currents to support pilot decision-making over multi-day missions. (Colab: Autonomous Systems Bootcamp, University of Delaware | Aug 2024)

Selected Publications

• **A. Abdullah**, T. Barua, R. Tibbetts, Z. Chen, M. J. Islam, I. Rekleitis, "*CaveSeg: Deep Semantic Segmentation and Scene Parsing for Autonomous Underwater Cave Exploration*," IEEE ICRA 2024.

• **A. Abdullah**, R. Chen, I. Rekleitis, M. J. Islam, "*Ego-to-Exo: Interfacing Third Person Visuals from Egocentric Views in Real-time for Improved ROV Teleoperation*," ISRR 2024. [Best Paper Collection]

• A. Gupta, **A. Abdullah** (co-first author**)**, X. Li, V. Ramesh, I. Rekleitis, M. J. Islam, "*Demonstrating CavePI: Autonomous Exploration of Underwater Caves by Semantic Guidance*," RSS 2025.

• J. M. Sheldon, W. Zhu, **A. Abdullah**, K. Butler, M. J. Islam, S. Rampazzi, "*Deep Note: Can Acoustic Interference Damage the Availability of Hard Disk Storage in Underwater Data Centers?*," ACM HotStorage 2023. [Best Paper Award]

Full list available at: scholar.google.com/citations?user=0vWxyQMAAAAJ&hl=en

Presentations

• Presented "LC-MAP" poster at Nelms Annual IoT Conference 2025, FL, US.

• Delivered oral and poster presentations of "CaveSeg" at ICRA 2024, Yokohama, Japan.

• Presented two workshop papers ("Dense Water Quality Sensing" and "LightViz") at the RUNE Workshop, ICRA 2024, Yokohama, Japan.

• Showcased "DarkMask" project at the Center for Coastal Solutions Summit 2023, FL, US.

Awards & Honors

• Best Poster Award, Nelms Annual IoT Conference (2025)

• Best Paper Award, ACM Workshop on Hot Topics in Storage and File Systems (2023)

• Dean's Honors List, Bangladesh University of Engineering and Technology (2019)

Leadership & Service

• Reviewed 20+ research papers for prestigious robotics conferences (ICRA, IROS, RSS, ISRR) and journals (IEEE T-HMS, T-CI, T-CSVT, JoE, RA-L, ACM T-HRI).

• Mentored the NemoGator team in building a biomimetic robot for marine ecosystem monitoring.

• Supervised two undergraduate students on CaveSeg dataset collection, labeling, and curation.

• Conducted Building Nemo workshops and RoboGator Day demos under UF's RISE-CPET program.

Other Interests

Soccer, Travel, Scuba diving (certified open-water diver)