

# Adnan Abdullah

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

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## Professional Summary

PhD researcher in robotics, computer vision, and autonomous systems with hands-on experience spanning perception, navigation, SLAM, and AI-driven autonomy in GPS-denied, sensor-degraded environments. Proven track record of designing and deploying end-to-end robotic systems, validated through digital twin simulations and real-world testing with UGV/AUV/ROV platforms. Strong background in core robotics (kinematics, sensing), deep learning (large model training and tuning), and vision-language models. Proficient in ROS, Python, PyTorch, and Linux.

## 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
- MS in Electrical and Computer Engineering (en route to PhD), University of Florida | Dec 2025
- BS 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, NumPy), CUDA, TensorRT, MATLAB
- Robotic Software: ROS1 Noetic, ROS2 Galactic/Humble, Gazebo, RViz, FoxGlove
- Robot Platforms: BlueROV2, BlueBoat, Aqua2, NemoSens, 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. Built an egocentric-to-exocentric view synthesis pipeline on ORBSLAM3 backbone to enhance operator spatial awareness in confined environments, validated through user studies (SUS score: 77.5), Gazebo simulator, and real underwater cave/spring deployments.
- Introduced **CaveSeg**: The first annotated underwater cave image dataset (13 classes) and a vision-transformer-based semantic segmentation pipeline for visual servoing, matching Swin-T accuracy with <50% parameters and 1.8x faster inference.
- Developed **CavePI** and **NemeSys**: Custom AUVs and their digital twins for autonomous operation. Demonstrated intelligent navigation decision-making from semantic cues, visual-inertial state estimation via camera-IMU fusion, and optical-flow-based velocity control under strong current.
- 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.
- Proposed **Word2Wave**: A novel language-to-mission programming pipeline that utilizes the T5-Small language model to translate natural language instructions into executable mission plans, 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=0vWxyQMAAAJ&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)