Raihan Islam Arnob

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Fairfax, Virginia, USA

Education

2020–26 **Ph.D.**, Computer Science, George Mason University (GMU)
2020-23 **M.Sc.**, Computer Science, George Mason University (GMU)
2012-16 **B.Sc.**, Computer Science and Engineering, Islamic University of Technology (IUT)

Experience

2020– PhD Graduate Researcher, RAIL Lab, George Mason University, (Advisor: Dr. Gregory J. Stein)

- Formulated an integrated behavior planning and motion planning approach using Python, ROS2, and MoveIt, enabling efficient robotic task execution in unseen environments. This system, which leveraged optimization of classical planning and learning-augmented search, reduced task completion time by 28%. Successfully deployed and validated this high-efficiency system on a Boston Dynamics Spot robot, demonstrating real-world application on embedded systems.
- Implemented a learning-informed object search module in Python using PyTorch to enhance the decision making of the behavior planning stack, achieving a 60% optimization in object discovery time compared to non-learned approaches.
- Developed an anticipatory behavior planning algorithm for long-horizon decision making in large-scale environments (e.g., houses, restaurants). This method, with applications in fields like autonomous driving, uses Graph Neural Networks and sampling for the optimization of multi-task sequences, resulting in a 40% reduction in completion time in persistent settings.
- Developed a decision making framework for active information gathering, enabling the behavior planning system to optimize its strategy in unfamiliar environments by seeking out pertinent information, improving goal-reaching efficiency by 36% on average.

- Devised a method for long-horizon navigation decision making by incorporating predictions of occluded environmental features. This approach informed the motion planning and trajectory generation modules, resulting in a 15% optimization of the cost-to-go, a critical challenge in autonomous driving.

2020–2020 PhD Graduate Researcher, PIXEL Lab, Utah State University, (Advisor: Dr. Mahdi Nasrullah Al-Ameen)

- Developed a web application using React, mimicking the user interface of iOS for the qualitative study on usable security and privacy of the users for handheld devices.
- Designed and conducted user studies on participants from various backgrounds and ages, finally coded and qualitatively analyzed their responses for research insights.

2016-2017 Software Engineer, ICT Centre, IUT

- Developed an IoT-enabled Cafeteria Management System integrating RFID tracking and real-time monitoring; implemented demand forecasting algorithms that cut operational waste by over 30%.
- Developed a Bootstrap-powered web application to digitize manual seat allotment, allowing 100% remote room selection. The system reduced administrative processing time by 90% (3 weeks to 48 hours), allowing students to move in immediately following the weekend allocation.

Research Interests

Robotics, Task planning under uncertainty, Learning informed planning, Abstractions for hierarchical planning under uncertainty, Long-horizon information gathering

Awards & Honors

2023 Outstanding Academic Achievement for M.Sc. in Computer Science at GMU
2016 First Class with Honors for B.Sc. in Computer Science and Engineering at IUT
2012–2016 Four years of OIC Scholarship for Undergraduate Studies at IUT

Publications

Google Scholar

Journal Articles

J1. **Sultana, Sharifa**, Saha, P., Hasan, S., Alam, S. R., Akter, R., Islam, M. M., Arnob, R. I., Islam, A. N., Al-Ameen, M. N. & Ahmed, S. I. Imagined Online Communities: Communionship, Sovereignty, and Inclusiveness in Facebook Groups. *Proceedings of the ACM on Human-Computer Interaction* **6,** 1–29 (2022).

Peer-reviewed Conference Proceedings

C1. **Talukder, Md Ridwan Hossain**, Arnob, R. I. & Stein, G. J. *Anticipatory Planning for Performant Long-Lived Robot in Large-Scale Home-Like Environments* in *IEEE International Conference on Robotics and Automation (ICRA)* (2025).

C2. **Arnob, Raihan Islam** & Stein, G. J. *Active Information Gathering for Long-Horizon Navigation Under Uncertainty by Learning the Value of Information* in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)* (2024).

C3. **Arnob, Raihan Islam** & Stein, G. J. *Improving Reliable Navigation Under Uncertainty via Predictions Informed by Non-Local Information* in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)* (2023), 2830–2837.

C4. **Mahmud, Junayed**, Faisal, F., Arnob, R. I., Anastasopoulos, A. & Moran, K. *Code to comment translation: A comparative study on model effectiveness & errors* in *ACL-IJCNLP* (2021).

C5. **Sultana, Sharifa**, Saha, P., Hasan, S., Alam, S. R., Akter, R., Islam, M. M., Arnob, R. I., Al-Ameen, M. N. & Ahmed, S. I. *Understanding the sensibility of social media use and privacy with Bangladeshi Facebook group users* in *Proceedings of the 3rd ACM SIGCAS Conference on Computing and Sustainable Societies* (2020), 317–318.

Working papers

W1. **Arnob, R. I.**, Merlin, M., Paudel, A., Hedegaard, B., Konidaris, G. & Stein, G. J. *Effective Task Planning with Missing Objects using Learning-Informed Object Search* submitted @ RA-L. 2026.

W2. **Bui, H.**, Arnob, R. I., Khanal, A., S. & Stein, G. J. *Scout-Assisted Planning for Heterogeneous Robot Teams under Partially Known Environments* to be submitted @ IJCAI. 2026.

W3. **Mack, N.**, Arnob, R. I. & Stein, G. J. *Dynamic Surfacing Strategies for Efficient AUV Coverage Path Planning Under Localization Uncertainty* to be submitted @ IJCAI. 2026.

W4. **Paudel, A.**, Khanal, A., Arnob, R. I., Hossain, S. & Stein, G. J. *Object Search in Partially-Known Environments via LLM-informed Modelbased Planning and Prompt Selection* submitted @ IROS. 2026.

Projects

Within Robotics Domain

Object location estimator: I trained a compact neural network that tells probability of finding some object (i.e., egg) in some location (i.e., refrigerator in a kitchen) using PyTorch that has been used in single robot task planning with missing objects and multi-robot object search.

Environment simulator: Developed a custom high-level simulator inspired by ProcTHOR to support flexible task and navigation planning. Unlike RoboTHOR, the simulator allows defining custom robot actions and directly transitions between outcome states without full GUI-based simulation. This design enables fast evaluation of high-level task planning approaches by bypassing step-by-step physical simulation, significantly reducing computational overhead. This simulator has been adopted in projects depicting environments like households and restaurants.

Others

2048-puzzle game: Replicated 2048 puzzle game using Java as part of Visual Programming course project during undergraduate.

Presentations

2026	(Pre-defense Presentation) *Effective Long-Horizon Planning under Uncertainty for Indoor Mobile Robots*, George Mason University, VA, USA
2025	(Dissertation Proposal Presentation) *Long-Horizon Planning under Uncertainty for Indoor Mobile Robots*, George Mason University, VA, USA
2023	(Research Paper Presentation) *Improving Reliable Navigation Under Uncertainty via Predictions Informed by Non-Local Information*, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), MI, USA
2023	(Comprehensive Exam Presentation) *Point Goal Navigation under Uncertainty: A Survey*, George Mason University, VA, USA

Teaching

George Mason University - Department of CS

2022-23	Graduate Teaching Assistant, Courses: Data Mining, Database Systems
2020-21	Graduate Teaching Assistant, Courses: Introduction to Computer Programming

Islamic University of Technology - Department of CSE

2019	Lecturer, Courses: Graph Theory, Digital Logic Design, Mathematical Analysis
2018	Lecturer, Courses: Web Programming, Operating Systems
2017	Lecturer, Courses: Programming Fundamentals (C), Unix Programming, Algorithm, Java

Student Mentorship

George Mason University's Aspiring Scientists Summer Program

2025	Mentored 3 High-school students

2024 Mentored 4 High-school students
2023 Mentored 3 High-school students

Academic Service

Research Paper Reviewer

2026 Reviewed paper for IROS 2026 (1)
2025 Reviewed paper for RA-L 2025 (1), ICRA 2026 (2)
2024 Reviewed paper for IROS 2024 (1), ICRA 2025 (1)

Technical Skills

Programming Languages: Python, C++, PDDL, C, Java, Perl, Shell Scripting, JavaScript, R, MATLAB, PHP, HTML, Swift, Objective C

Frameworks: PyTorch, TensorFlow, HuggingFace, ROS2, Agentic AI, MoveIt, Nav2

Simulators: Unity, Carla, Gazebo

CI/CD & DevOps Tools: Git, Docker, Jenkins, GitLab

Databases: Oracle, MySQL, PostgreSQL, MongoDB, SQLite, Apache Spark

Learning & AI: Deep Learning, Deep Reinforcement Learning, Generative AI, Diffusion, Flow-matching

Other Experience

2016 Led a robotics team of 16 undergraduates from Bangladesh to participate in University Rover Challenge 2016 in Hanksville, Utah, USA.

References

Assistant Professor Gregory J. Stein
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Associate Professor George Konidaris
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