Utsha Kumar Roy

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Education

M.Sc. in Robotics & Mechatronics Engineering **2023 – 2025 (Final Result Awaiting)**
University of Dhaka ***CGPA: 3.98/4.0, Ranked 1st***
Thesis Title: Human-Aware Robot Navigation in Dynamic Crowds Using Reinforcement Learning and Attention-Based Interaction Models -[Dissertation Report] - [Website]
Supervisors: **Dr. Sejuti Rahman**

B.Sc in Robotics & Mechatronics Engineering **2018 – 2023**
University of Dhaka ***CGPA: 3.71/4.0, Ranked 1st***
Thesis Title: 3D Mapping Using Graph Convolutional Neural Network for Autonomous Navigation - [Dissertation Report]
Supervisors: **Dr. Sejuti Rahman**

Higher Secondary School Certificate(HSC) **2015 – 2017**
Notre Dame College ***GPA: 5.00/5.00***
Group: Science
Board: Dhaka

Experience

Academic

BRAC University **June-2025 – ongoing**
Lecturer *Dhaka, Bangladesh*

- Taught CSE461: Introduction to Robotics, covering robot kinematics (forward & inverse), motion planning, and mobile navigation fundamentals
- Led weekly robotics labs and designed hands-on exercises on core robotics workflows/tools to bridge theory with practice
- Served as faculty mentor to BRAC University's robotics club; organized workshops, project clinics, and competition preparation
- Supervised student projects, tutorials, and office-hour coaching; guided teams on problem-driven implementations

Industrial

Anwar Group of Industries (AGI) **March-2024 – October-2024**
Robotics Developer *Dhaka, Bangladesh*

- Developed a ROS2 simulation project for UR robot, implementing a forward kinematics system for robot arm control.
- Designed a simulation to pick a carton box in 2D form, convert it into a 3D shape, close the fins at the bottom of the carton, and place it on the conveyor belt for further automation.
- Developed a Unity 3D simulation system featuring AI-controlled cars using the NavMesh agent for navigation.
- Created a virtual simulation environment modeled after a science laboratory in Dhaka, incorporating a three-way intersection with signal control.
- Generated image datasets automatically, with built-in car detection and classification annotations for future AI model training and testing.

Research Fellow

Centennial Research Grant, University of Dhaka **2024 – ongoing**
Research Assistant *(IHABOTv2)* *Advisor* - ***Dr. Sejuti Rahman***

- Currently leading the navigation stack development for the project.
- Designed and implemented robot navigation algorithms for autonomous movement.
- Now working on embedded systems, integrating health-measuring sensors to collect real-time patient data.
- Applying Machine Learning (ML) models on sensor data to assist in diagnosing patient health conditions.

Centennial Research Grant, University of Dhaka **2022 – 2023**
Research Assistant *(Unmanned Aerial Vehicle(UAV)-Cop)* *Advisor* - ***Dr. Sejuti Rahman***

- Develop a system to collect data from drones and manage the implementation of machine learning algorithms.

Centennial Research Grant, University of Dhaka **2021 – 2022**

Research Assistant *(IHABOT: Intelligent Hospital Assistance Robot)* *Advisor -* ***Dr. Sejuti Rahman***

- Led the project focused on reducing doctor-patient interactions during pandemics, responsible for autonomous navigation and vision-based machine learning algorithms.
- [Report]

University Grants Commission of Bangladesh **2019 – 2022**

Research Assistant *(Autonomous Underwater Docking(AUV) Docking System)* *Advisor -* ***Dr. Shugata Ahmed***

- Developed a docking system for an autonomous underwater vehicle (AUV) equipped with multiple sensors and vision.

Workshops Instructor

NAO Robot Workshop **2022**

Department of Robotics & Mechatronics Engineering, University of Dhaka *Dhaka, Bangladesh*

- This was a one day workshop where I trained the students how to code and operate the NAO robot.

ROS2 Workshop **2023**

Department of Robotics & Mechatronics Engineering *Dhaka, Bangladesh*

- In this workshop, I taught the basics of ROS2 architecture, simulation, visualizations and physical robot programming.

Mentorship & Judge

Mentor **2018 – 2023**

Bangladesh Robot Olympiad(BdRO) *Bangladesh*

- I served as a mentor for one team every year. Additionally, throughout the year, those teams received silver and bronze awards at the International Robotics Olympiad(IRO)

Judge **2023**

13^{th} *National Science Carnival* *Dhaka, Bangladesh*

- Line Following Robot Segment at Dhaka Residential Model College(DRMC)

Projects

Camera Calibration using Aruco **2024**

M.Sc Course Project *Computer Vision*

- Developed a pyhton package for calibration of RGB camera for robotics vision, mobile camera using Aruco
- [GitHub Link]

Reward function generation by Large Language Models (LLMs) **2024**

Self Learning Project *Dhaka, Bangladesh*

- Developed a system utilizing Reinforcement learning (RL) to train a Panda robot using the Panda-Gym package, where rewards are generated by open source Large Language Models (LLMs) such as LLaMA2 and ChatGPT.
- [GitHub Link]

Autonomous Navigation Robot **2020**

Personal Project *Dhaka, Bangladesh*

- Developed a four-wheeled autonomous robot using ROS libraries like gmapping, amcl, and RRT motion planning.
- [GitHub Link]

Fire Rescue Robot **2018 – 2019**

Information and Communication Technology(ICT) Division *Dhaka, Bangladesh*

- Designed a mobile robot as it can climb stairs as well as assembled the parts of the robot body and implemented the control algorithms.

Piano Playing Robot **2018**

B.Sc Course Project *Fundamental of Mechatronics Engineering Lab*

- Designed robotic hand on solidworks and programmed to controlled those hand to play a music. - [Video]

Honours and Awards

Runners up for IHABOTv2 **2025**
ROBOTRONICS FEST 2025 *Project Showcase*

Jagannath Hall Merit Award **2025**
Jagannath Hall, University of Dhaka *Awarded based on my Academic Achievements.*

National Science & Technology Fellowship **2023**
Ministry of Science & Technology, Bangladesh *Awarded based on M.Sc thesis.*

Runners up **2022**
Robotics In Bangladesh: Academia & Industry Initiative *Best poster presentation*

Runners up **2022**
Dhaka University Science Fair *Best research project for IHABOT.*

Research Scholarship **2022**
IFIC Bank Trust Fund *Undergraduate thesis research.*

Mitsubishi UFJ Foundation Scholarships **2020**
University of Dhaka *Awarded based on outstanding results & recommendation of department*

Runners up **2020**
Robotics & Artificial Intelligence Category, DUCSU Sciense and Technology Olympiad 2020

Luna Shamsuddin, Chairman, Scholarship **2018-2019**
Janata Bank Limited, Bangladesh *Awarded for ranked first in Semester finals*

Publications

[1] **Roy, U. K.**, & Rahman, S. (2025), ***"TAGA: A Tangent-Based Framework for Socially Compliant Robot Navigation Around Human Groups," [Preprint]. arXiv:2503.21168.*** - *[Website]*
[2] ***"A Novel Docking System For Autonomous Underwater Vehicle"*** *Presented in* ***International Conference on Mechanical, Industrial and Materials Engineering - ICMIME-2022*** - *[Paper]*

Technical Skills

Robot Frameworks: ROS, ROS2, Nav2, OpenAI Gym, Isaac Gym, Moveit
Tools: OpenCV, PCL, Keras, Pytorch, Tensorflow, LaTeX, Docker, Weight and Bias
Programming Languages: Python, MATLAB, C++, C, Java
Simulators: Unity, Gazebo, V-REP

Languages

Bangla: Mother Tongue
English: IELTS Overall Band: 7.0 (Listening: 7.0, Reading: 7.5, Writing: 6.0, Speaking: 7.0)

References

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