Syed Izzat Ullah

Robotics & ML Engineer

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Syed Izzat Ullah | Corpus Christi, TX, USA

Professional Summary

Ph.D. candidate specializing in robotics and autonomous systems, with expertise in autonomous navigation, motion planning, sensor fusion, and multi-modal trajectory forecasting for collision avoidance. Skilled in designing robotic assemblies, developing ML-based control strategies, and validating solutions in both simulation and hardware. Collaborative team member with a publication record. Seeking to apply expertise to tackle complex autonomy challenges in industry.

Education

Ph.D. Computer Science — Robotics & ML — 3.75 (4.00) CGPA
Texas A&M University-Corpus Christi, USA — *May 2022– May 2026*

Dissertation focus: "Developing a predictive navigation system that enables UAVs to safely operate alongside unpredictable dynamic obstacles, such as birds, by forecasting their motion in real-time."

M.S. Electrical Engineering — Robotics & Control — 3.16 (4.00) CGPA
Lahore University of Management Sciences (LUMS), Pakistan — *2017-19*

B.S. Telecommunication Engineering — 3.83 (4.00) CGPA
Balochistan University of IT, Engineering & Management Sciences, Pakistan — *2012-16*

Technical Expertise

Robotics: ROS, Gazebo, CARLA, Unreal Engine, VICON, OptiTrack, Crazyflie, Turtlebot3, UR5, Leo Rover
AI/ML: Reinforcement Learning (DRL), Transformers, Multi-modal Learning, Time Series Forecasting
Languages: Python ((PyTorch, NumPy, SciPy, Pandas, scikit-learn), C++, MATLAB, Shell scripting, CMake
Control: Model Predictive Control (MPC), PID, Trajectory Optimization, Optimization (CVX, Gurobi)
Planning: Search-Based(A*, D*), Sampling-based(RRT*, PRM), Multiagent, Uncertainty-aware Navigation
Sensors: IMUs, LiDAR, RGB-D cameras, Sensor fusion, UAV autopilots, Comm protocols
Tools: Docker, Git, SolidWorks, LabVIEW, and CI/CD Pipelines

Research Experience

Graduate Research Assistant — Texas A&M University-Corpus Christi — May '22 – Present

- **Developed POF+MADER**, a novel UAV trajectory planner that integrates a real-time probabilistic obstacle filter with optimization-based planning, reducing collisions by 39% in simulation (ROS/Gazebo) and 25% in hardware trials with Crazyflie quadrotors (Video).
- **Designed and developed a coaxial modular aerial system** with reconfigurable capabilities, enabling adaptive morphology for diverse mission requirements including payload transport, inspection, and manipulation tasks(Video).
- **Developed transformer-based multi-modal forecasting** system fusing vision/LiDAR data, to forecast long-horizon future trajectories of complex, non-cooperative, and non-linear moving obstacles, for UAVs' safe collision avoidance and navigation.
- **Advancing an uncertainty-aware framework** that accounts for sensor noise, wind disturbances, and obstacle behaviors, targeting a 30% reduction in collision risks in real-world conditions (ongoing).
- **Conducting validation** through simulations(ROS/Gazebo) and on hardware (Crazyflies) to demonstrate the safety and efficiency of the framework for urban air mobility and package delivery applications(Video).

Team Lead — National Center of Robotics & Automation — Dec '19 – May '22

- **Led team of 10 researchers** developing learning-based search and rescue robots, integrating deep reinforcement learning for locomotion control with formal methods for safety verification.
- Designed **policy learning architectures** for snake robot navigation, achieving autonomous exploration in unstructured environments through learned visuomotor control (Video).

- Developed an **autonomous mobile robot** for targeted digital marketing in public spaces (airports, malls), integrating real-time crowd density sensing/stats, autonomous navigation, and adaptive content delivery to maximize audience reach and engagement (Video).
- **Managed** project timelines, coordinated with funding agencies, and supervised junior researchers.

Visiting Researcher — Robotics Research Lab, TU Kaiserslautern Jul – Sep '19

- Created a **realistic canal-like simulation environment** in Unreal Engine (UE4) and Microsoft AirSim for testing autonomous drone navigation in challenging outdoor scenarios.
- Implemented **motion and trajectory planning algorithms** for autonomous drone navigation with collision avoidance in GPS-denied environments(Video).

Research Assistant - National Center of Robotics & Automation Jan – Jun '19

- Evaluated **motion planning and obstacle avoidance algorithms** (RRT*, A*, dynamic window approach) for safe drone navigation in dynamic environments.
- Developed **point cloud fusion pipeline** integrating stereo camera and 2D LiDAR data, improving environment perception accuracy.

Key Projects

- **Autonomous Restaurant Robot:** ROS/Gazebo-based autonomous serving robot with optimized path planning (99% success rate).
- **DRL Obstacle Avoidance:** End-to-end deep-RL pipeline in Unreal Engine + Microsoft AirSim for UAVs collision-free navigation (95% success rate).
- **Urban Mobility Simulation:** CARLA/ROS environment for autonomous multi-agent navigation testing.
- **Agriculture Navigation Simulation:** Designed a ROS/Gazebo-based autonomous agriculture robot. Integrated sensor data (camera, IMU) for mapping and autopilot control.

Research Publications

- **Syed I. Ullah**, J. Baca, et al., "Transformer-Based Multi-Modal Trajectory Forecasting for UAV Navigation in Dynamic, Uncertain Environments," *IEEE Robotics and Automation Letters* (*RA-L*), (Under Review).
- **Syed I. Ullah**, J. Baca, et al., "SynTraG: A Synthetic Trajectory Generator for Non-Cooperative Dynamic Obstacles in UAV Navigation," *Latin American Congress on Automation and Robotics* (*LACAR 2025*), Springer.
- **Syed I. Ullah**, J. Baca, et al., "POF+MADER: Trajectory Planner in Multiagent and Dynamic Environments with Improved Collision Avoidance," *IEEE Access*, vol. 13, 2025. (Video, PDF).
- J. Baca, **Syed I. Ullah**, et al., "Coaxial Modular Aerial System and the Reconfiguration Applications," *IEEE International Conference on Robotics and Automation* (*ICRA 2023*), London, UK. (Video, PDF).
- **Syed I. Ullah** et al., "Autonomous Navigation and Mapping of Snake Robots for Urban Search and Rescue (USAR)," *IEEE International Conference on Robotics and Artificial Intelligence* (*IEEE ICRAI 2023*). (PDF).
- **Syed I. Ullah** et al., "Autonomous Navigation and Mapping of Water Channels in a Simulated Environment Using Micro-Aerial Vehicles," (*IEEE ICRAI 2023*). (Video, PDF).
- **Syed I. Ullah** et al., "Motion Planning for a Snake Robot using Double Deep Q-Learning," *IEEE International Conference on Artificial Intelligence* (*IEEE ICAI 2021*). (PDF).

Academic Awards

Ph.D. Research Fully Funded 'May 2022-25
National Science Foundation

IEEE RAS Summer School on Multi-Robot Systems Attendee 'Jul 2023
Czech Technical University

3rd Place Throughout the Engineering and Computer Science Category 'Mar 2023
18th Annual TAMUS Pathways Student Research Symposium

Silver Medalist in BS – Telecommunication Engineering 'Dec 2016
Balochistan University of IT, Engineering & Management Sciences (BUITEMS)

Professional Certifications & Training

Udacity Nano-Degrees
Robotics Software Engineer, Introduction to Self Driving Cars, Flying Cars & Autonomous Flight Engineer

Coursera Specialization
Mathematics for Machine Learning, Robotics: Computational Motion Planning, Python for Everybody