

# KHUZEMA HABIB

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## Education

University of Maryland, College Park

2024 - 2026

Master of Engineering, Robotics

GPA 3.73/4

Manipal Institute of Technology

2019 - 2023

Bachelor of Technology, Mechanical Engineering

GPA 8.03/10

## Technical Skills

Languages: Python, C++

Libraries and Tools:: ROS2, PyTorch, OpenCV, Raspberry Pi, Jetson Nano, Arduino, Gazebo, IsaacSim, CARLA

Mechanical Engineering: CAD/CAM(SolidWorks, Creo, Fusion360) , 3D Printing, Simulation(Ansys, COMSOL, MATLAB), CFD (Fluent, CFX, FluidX3D)

## Experience

Graduate Research Assistant

Aug 2025 – Present

Robotics Algorithms and Autonomous Systems Lab - University of Maryland

MD, USA

- Gathered **100+ expert demonstration data** via teleoperation of a **UR3e** robotic arm and tested on lightweight **Imitation learning** models using an **affordance-guided** framework that distills a minimal set of **semantic 2D keypoints** from a text prompt and a single image.
- Conducted flight trials to collect trajectory datasets for **Crazyflie drone control systems**, developing **Contextual NeuroMHE Controllers** to **improve adaptability** and reduce trajectory deviations in **turbulent environments**.
- Autonomous** Indoor Navigation and **Mobile Manipulation** with Jetson Nano on Turtlebot2 Platform (*Ongoing*)
- Real-time **CFD Based Estimation** with FluidX3D for Contextual NeuroMHE **Quadrotor Controller** in Turbulent Environments (*Ongoing*)

Grading Assistant - Control of Robotic Systems

Sep 2025 – Present

Maryland Applied Graduate Engineering - ENPM 667

MD, USA

- Assisted in grading assignments for Control of Robotic Systems, helping 35+ students understand control system design, including PID and LQR controllers, and real-world applications in robotics, for system modeling and optimization.

Graduate Research Assistant

Feb 2025 – Aug 2025

Smart Materials and Structures Lab - University of Maryland

MD, USA

- Conducted advanced simulations using ANSYS to model and analyze the behavior of smart materials, including piezoelectric materials, for applications in energy harvesting.
- Mathematical Modeling of Flow Environments by leveraging CFD with Ansys Fluent.
- Acoustics and Vibration Analysis for Vibration Dampening solutions in Acoustic Black-Hole applications.

Computational Fluid Dynamics Simulation Intern

Jun 2022 – Jul 2022

Indian Institute of Technology, Bombay

Mumbai, India

- Performed 2D and 3D CFD simulations for a rocket thruster, aiming to identify the optimal fuel and oxidizer injector configurations for maximum atomization efficiency.
- Gained hands-on experience with simulation tools and contributed to improving injector design for increased propulsion efficiency.

## Publications

Contextual Neural Moving Horizon Estimation for Robust Quadrotor Control in Varying Conditions

Kasra Torshizi, Chak Lam Shek, Khuzema Habib, Guangyao Shi, Pratap Tokekar, Troi Williams

- Developed a reinforcement learning-based adaptive controller enabling robust quadrotor trajectory tracking across diverse environments with 20.3% trajectory error reduction on Crazyflie Drones

AFFORD2ACT: Affordance-Guided Automatic Keypoint Selection for Generalizable and Lightweight Robotic Manipulation

Anukriti Singh, Kasra Torshizi, Khuzema Habib, Kelin Yu, Ruohan Gao, Pratap Tokekar

- Developed an affordance-guided keypoint selection framework enabling lightweight, real-time robotic manipulation with 82% success on unseen objects.

## Projects

- Autonomous Mobile Manipulator** : Built and developed a fully autonomous robot capable of computer vision-based object localization, sensor-fused navigation, and servo-controlled manipulation for complete pick-and-place tasks.
- Visual Servoing with MPC for Nonholonomic Robot Steering** : Designed MPC visual servoing controller for Turtlebot3 navigation using RealSense and Aruco markers, demonstrating smoother control and faster goal achievement than PD.