Mohammed Azharudeen Farook Deen

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About

Robotics Engineer with a strong focus on melding **deep learning**, **reinforcement learning**, and **optimal control** to create agile and collaborative robots.

Skills

Programming: Python, C++, MATLAB
Machine Learning & AI: PyTorch, JAX, TensorFlow, Deep Learning (CNNs, RNNs, Transformers), Reinforcement Learning (PPO, SAC), Imitation Learning (BC)
Robotics & Simulation: ROS, ROS2, Isaac Sim, Isaac Gym, Mujoco, NVIDIA Warp, Orbit
Optimization & Control: Model Predictive Control (MPC), Quadratic/Nonlinear Programming (QP, SQP), Position/Force/Torque Control
Development Tools & Systems: Git, Docker, Linux
Languages: English (Business Fluency), German (Beginner), Tamil (Native)

Relevant Work Experience

Intern *Stuttgart, Germany*
Fraunhofer IPA *July 2024 – Mar 2025*

- Developed a custom Peg-in-Hole **Mujoco** environment for physics simulation with domain randomization and ROS1 / ROS2 frameworks to control a real robot equipped with a Robotiq hand-e gripper.
- Implemented and tuned controller module with various methods like Inverse Kinematics, Impedance, and hybrid position-force controllers.
- Implemented teleoperation modules for keyboard and spacemouse control for **Learning from Demonstrations** and Human-in-the-Loop RL.
- Adapted the simulation environment to work with real-time SAC and BC learning pipelines developed by HIL-SERL project in Python and JAX.

Robot Learning of Quadrupedal Locomotion on Deformable Terrain *Master Thesis — RWTH Institute for Data Science in Mechanical Engineering (DSME) and RWTH Institute of Geomechanics and Underground Technology (GUT)* *Aachen, Germany* *Sep 2023 – Mar 2024*

- Identified the challenges quadrupeds face when transitioning from rigid to deformable terrain.
- Integrated a particle-based contact model to simulate the complex behaviors of granular materials in **NVIDIA Isaac Sim**, developed an adaptable and robust controller using reinforcement learning (RL) with the PPO algorithm in PyTorch to follow a unified policy in diverse natural environments and evaluated the performance with sim-to-real additions.
- Preliminary work accepted for proceedings at the 1st German Robotics Conference (GRC2025), and a related paper is being finalized for publication in the journal

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Education

RWTH Aachen University *Oct 2021 – Dec 2024*
Master of Science in Robotic Systems Engineering

- *Coursework:* Robotic Systems, Advanced Machine Learning, Introduction to AI, Computer Vision, Reinforcement Learning and Learning-Based Control, Linear Control Systems, Numerical Optimization, etc.

Shiv Nadar University *Aug 2015 - May 2019*
Bachelor of Technology in Mechanical Engineering

- Specialization in Computational Techniques; Minor in Electronics and Communication Engineering

Accepted Conferences

Rapid Quadrupedal Locomotion on Deformable Terrain - 1st German Robotics Conference March 2025
Mohammed Azharudeen Farook Deen, Omer Kemal Adak, Raul Fuentes
https://www.robotics-institute-germany.de/conference/

A Novel Heat Transfer Mechanism Using Acoustic Waves - Presented at International Heat and Mass Transfer Conference, IIT Roorke Dec 2019
Azharudeen M, Pothuri C, Subramani K

Journal Publications

Theory of nonlinear acoustic forces acting on inhomogeneous fluids. Journal of Fluid Mechanics. [IF(2022)-3.7] April 2022
Rajendran VK, Jayakumar S,*Azharudeen M*, Subramani K
https://doi.org/10.1017/jfm.2022.257

Heat transfer mechanism driven by acoustic body force under acoustic fields. Physical Review Fluids. [IF(2021)-2.5] July, 2021
Azharudeen M, Kumar V, Pothuri C, Subramani K
https://doi.org/10.1103/PhysRevFluids.6.073501

Rapid mixing in microchannel using standing bulk acoustic waves. Physics of Fluids. [IF(2020)-3.5] Dec 2019
Azharudeen M, Pothuri C, Subramani K
https://doi.org/10.1017/jfm.2022.257

Additional Experience & Projects

Student Assistant *Aachen, Germany*
RWTH Institute for Automatic Control (RWTH IRT) *May 2023 – June 2024*

- Extended codebase of a unified C++ interface for various quadratic programming solvers (QP) to nonlinear programming (NLP) solver like IPOPT and included loosely coupled tools for MPC, NMPC, SQP, auto differentiation, Hessian regularization methods, etc with appropriate test cases.
- Involved in the Fernbin project, where my tasks included developing simple simulation for testing control systems in Python and ROS2 for ships that react dynamically to the surroundings.

Research Project *Aachen, Germany*
Automated and Connected Driving Challenges — RWTH Institute for Automotive Engineering (ika) *Apr 2023 – Aug 2023*

- Enhanced trajectory planning in autonomous vehicles using Model Predictive Control (MPC) by refining the cost function to include better prioritization of dynamic elements and explored integrating hard constraint-level collision avoidance.

Teaching Assistant *Aachen, Germany*
RWTH Institute of Geomechanics and Underground Technology (RWTH GUT) *Apr 2023 – Sep 2023*

- Implemented engaging programming exercises, conducted tutorial sessions, fostering student understanding of key robotics programming concepts in Python and ROS for the course “Introduction to Robotics”.

Research Assistant *Kancheepuram, India*
Microscale Transport Laboratory, Indian Institute of Information Technology (IIITDM)) *Aug 2019 – Mar 2021*

- Studied predominant microscale phenomena subjected to acoustic fields and published results in various reputed journals.