

# M. Nomaan Qureshi

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**Research interests** I want to work at the intersection of Reinforcement Learning, Computer Vision and Robotics to design algorithms that can act in unstructured environments.

**Education** **Carnegie Mellon University** Pittsburgh, USA  
MS in Robotics August, 2023 – July, 2025  
Advisor: Prof. George Kantor.  
**GPA: 4.17/4.00**

**International Institute of Information Technology** Hyderabad, India  
Integrated BTech/MS in Computer Science August, 2018 – July, 2023  
Advisor: Prof. K. Madhava Krishna.  
**GPA: 8.75/10**

**Academic Achievements** ♦ **(Top 2 Percentile)** Dean's Research List for excellence in research for the academic year 2020-21 and 2021-2022.  
♦ **(Top 15 Percentile)** Dean's Merit List for academic excellence for the academic year 2019-20 and 2018-19.  
♦ **(Top 1 Percentile)** in JEE-Advanced 2018 (total participants : 1 Million)

**Publications** ♦ **SplatSim: Zero-Shot Sim2Real Transfer of RGB Manipulation Policies Using Gaussian Splatting**  
M. Nomaan Qureshi, Sparsh Garg, Francisco Yandun, David Held, George Kantor,, Abhisesh Silwal  
*Under Review at ICRA, 2025*

♦ **RTVS: A Lightweight Differentiable MPC Framework For Real Time Visual Servoing**  
M. Nomaan Qureshi\*, Pushkal Katara\*, Abhinav Gupta\*,..., K. Madhava Krishna  
*International Conference on Intelligent Robots and Systems (IROS), 2021.*

♦ **Imagine2Servo: Intelligent Visual Servoing with Diffusion-Driven Goal Generation for Robotic Tasks**  
Pranjali Pathre, Gunjan Gupta, M. Nomaan Qureshi, K. Madhava Krishna  
*International Conference on Intelligent Robots and Systems (IROS), 2024.*

♦ **Learning Object Manipulation Skills from Video via Approximate Differentiable Physics**  
Vladimir Petrik, M. Nomaan Qureshi, Josef Sivic, Makarand Tapaswi  
*International Conference on Intelligent Robots and Systems (IROS), 2022.*

♦ **Flow Synthesis Based Visual Servoing Frameworks for Monocular Obstacle Avoidance Amidst High-Rises**  
Harshit K. Sankhla\*, M. Nomaan Qureshi\*, ... K. Madhava Krishna

*International Conference on Automation Science and Engineering (CASE), 2022.*

◇ **Deep Sequenced Linear Dynamical Systems for Manipulation Policy Learning**

**M. Nomaan Qureshi**, Ben Eisner, David Held

*Generalizable Policy Learning Workshop, International Conference on Learning Representations (ICLR), 2022*

◇ **On Time-Indexing as Inductive Bias in Deep Reinforcement Learning for Sequential Manipulation Tasks**

**M. Nomaan Qureshi**, Ben Eisner, David Held

*Workshop on Learning Meets Model-based Methods for Manipulation and Grasping, (IROS), 2023*

◇ **Learning Arc-Length Value Function for Fast Time-Optimal Pick and Place Sequence Planning and Execution**

Prajwal Thakur\*, **M. Nomaan Qureshi**\*, ... K. Madhava Krishna

*International Joint Conference on Neural Networks (IJCNN), 2023.*

Research  
Experience

— **Research Assistant, Robotics Institute, Carnegie Mellon University, U.S.A.**

Advisor: Prof. George Kantor

October, 2023 – Present

- Developed teleoperation systems that led to impressive demos for a variety of projects in the lab. These systems enhanced remote control capabilities and demonstrated significant advancements in data collection abilities for robotic manipulation.
- Tackled the challenging problem of sim2real in robotics by proposing a viable solution using Gaussian splatting techniques. This approach aims to bridge the gap between simulation and real-world applications, improving the robustness and reliability of robotic systems.

— **Research Intern, Robotics Institute, Carnegie Mellon University, U.S.A.**

Advisor: Prof. David Held

April, 2021 – July, 2023

- Developed differentiable trajectory representation to accelerate the learning by 150% on tasks from MetaWorld benchmark. Formulated a reparametrization of Linear Dynamic Systems, which makes it possible to integrate LDS into any end-to-end differentiable system. [GPL Workshop, ICLR '22.]
- Solved various software engineering problems during the internship. Modified the Garage Reinforcement Learning Library to support multi-action policies, implemented control systems on the newly released Sapien simulator etc.

— **Research Assistant, Robotics Research Center, IIIT Hyderabad.**

Advisor: Prof. K. Madhava Krishna

May, 2020 – July, 2023

- Proposed a novel and lightweight visual servoing technique for fast navigation which is 10 times faster than existing state-of-the-art approaches. Utilized an effective sampling strategy for optimal control generation, resulting in a 74% decrease in the servoing time. [IROS '21]
- Formulated a framework that leverages the high-precision visual servoing frameworks for avoiding high-rise buildings. Our algorithm reduces the collision rate with buildings by 90% and is able safely navigate in an urban environment. [CASE '22]

— **Research Assistant, CVIT, IIT Hyderabad.**

Advisor: Prof. Makarand Tapaswi

September, 2021 – July, 2023

- Worked on integrating Video Object Segmentation (VOS) with skill learning from videos. The improved segmentation masks obtained from VOS led to a 10% improvement in the execution of skills.
- Proposed a differentiable approach to solving a set of Ordinary Differential Equations (ODEs) that allows us to approximately model laws of physics such as gravity, friction, and hand-object or object-object interactions.[IROS '22]

**Skills**

**Languages** : Python, C, C++, Bash, Javascript

**Frameworks** : Pytorch, Git, Tensorflow, Garage, Mujoco

**Platforms** : Linux, Web, MacOS, Windows, ROS, Arduino, Raspberry

**Selected  
Projects**

**Generating Birdview Occupancy Maps for KITTI Dataset**

Used pre-trained DL models and camera transformations for generating occupancy maps. The system takes a stereo pair and generates a depth map (using PSMNet) and an instance-segmented scene (using MaskRCNN). A 3D model was generated using the depth and camera parameters. Projecting this 3D point cloud to the ground frame gives the occupancy grid.

**Pose Graph Optimization (PGO) for 2D SLAM**

Optimized the 2D trajectory of a robot from scratch using the Levenberg-Marquardt method for non-linear least squares. PGO is typically used in most of today's SLAM Backend.

**Model Predictive Control for Path Planning**

Implemented the MPC algorithm for an omnidirectional robot to navigate a two-dimensional space, avoiding known locations with various obstacles given the localization information.

**Robotics/AI Sandbox**

Collection of core algorithms in Robotics, AI and CV implemented from scratch. Some examples: Implementation of back-propagation algorithm, GrabCut implementation.

**Implementation of Bash in C**

Implemented a Linux Bash shell (command line interpreter) in C. Supports various bash commands along with piping, foreground, and background processing.