

MOHAMED KHALID M JAFFAR

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SUMMARY

Robotics and autonomy researcher with 10 years of experience across diverse robotic platforms, including ground, aerial, and legged robots, UAVs, and sounding rockets. I specialize in motion planning, controls, and AI/ML for dynamical systems, with a focus on developing **intelligent motion-control** algorithms that ensure safety and reliability in uncertain environments. My work bridges theory and practice, pushing the performance limits of **autonomous agents** in real-world settings. I am seeking R&D roles where I can contribute to high-impact, intellectually challenging projects.

EDUCATION

University of Maryland, College Park, USA

Doctor of Philosophy (PhD) in Aerospace Engineering

Expected Fall '25

GPA: 3.62/4

Indian Institute of Technology Madras, India

Dual Degree (B.Tech & M.Tech) in Aerospace Engineering

2013 – 2018

Class Rank 1

Minor in Robotics

GPA: 9.06/10

SKILLS AND EXPERTISE

- **Conceptual Expertise:** Robot Autonomy, Motion Planning and Controls, Applied Mathematics, Machine Learning (ML), Generative AI and Large Language Models (LLMs)
- **Math background:** Numerical Optimization, Linear Algebra, Functional Analysis, Probability and Stochastic Processes, Differential Geometry, Data structures and Algorithms
- **Programming Languages:** C++, Python, Object-Oriented MATLAB, C
- **Tools and Software:** ROS, Simulink, Control System Toolbox, CasADi, Acados, PyTorch, SolidWorks

AWARDS AND HONORS

- Ann G. Wylie **Dissertation Fellowship** for pursuing *semester-long* academic research (Fall 2024)
- **Dean's fellowship** from the University of Maryland, College Park (2019)
- **Gold Medalist for best overall Academic record** in Dual Degree Aerospace Engineering (2018)
- **NTU-India connect Scholarship** from NTU, Singapore; *1 among 20 students from India* (2016)
- E. G. Tulapurkara **Institute Merit Prize** for best academic performance in Junior year (2015-16)

RELEVANT EXPERIENCE

Summer Scholar | U.S. Army Research Lab and GAMMA Lab, UMD

Summer '24

Project: *Long-range navigation of legged robots in outdoor terrain* | Advisor: Dr.Dinesh Manocha & Jason Pusey

- Field experiments of quadruped autonomous navigation in unmapped forest with trees, tallgrass, and mud
- Robot gait adaptation to tread uneven terrains, by leveraging visual perception through vision language models (VLMs), and haptic perception using inertial sensors

Graduate Research Assistant | Motion and Teaming Lab, University of Maryland

2018–24

PhD Thesis: *Safe feedback motion re-planning of mobile robots in dynamic spaces* | Advisor: Dr. Michael Otte

- Developing motion control algorithms for mobile robots that respect its kinodynamic constraints and compute optimal motion plans with guaranteed safety in environments with moving obstacles
- Designing fault-tolerant control strategies for multirotor aerial vehicles with one or more rotor failures
- Computing safe reachable sets using dynamical systems theory and numerical, non-convex optimization

Masters' Research | RAFT Lab and Robotics Lab, IIT Madras **2017–18**

Thesis: *Maneuver control of aerial robots in indoor spaces* | Advisor: Dr. Ranjith Mohan & Dr. Asokan Thondiyath

- On-board model-based control for aggressive maneuvers of quadrotors in tight, indoor spaces
- Synthesized and compared performance of different nonlinear controllers: backstepping, PI-PID, SMC
- Carried out field tests for system identification and evaluation of the various control strategies

Autonomy Lead & Co-founder | Team Noctua, DeTect Technologies | Tech startup **2015–17**

Product: *Autonomous aerial robot operations for infrastructure inspection in oil-gas industrial plants*

- One of the founding members of then seed-funded startup, focusing on technology development and operations, currently valued at \$138 million in Series B
- Developed autonomy algorithms and programmed aerial robots to trace predefined routes with precision, for inspecting faults and leaks in pipelines, furnaces and chimneys

Research Intern | IIT Madras – Defense R&D Organisation (DRDO) collaboration **Fall 2015**

Project: *Autonomous target-tracking unmanned aerial vehicle (UAV)* Advisor: Dr. Joel George

- Mathematically modeled the UAV system in MATLAB, and developed guidance and control strategies to generate and track reference trajectories
- Hardware experimentation using a VTOL hexacopter, involving Python programming

A full list of my research **publications** is available online at [Google Scholar](#).

APPLIED PROJECT EXPERIENCE

Systems Lead | Airbrake subteam, Terrapin Rocket team | Spaceport America Cup **2021–24**

Project: *Development of drag-modulating airbrake system to control a rocket's ascent* Las Cruces, NM

Awards: Placed **category 2nd** in 2023 and **overall 1st** in 2024, out of **150 teams globally**

- Led a 6 student team across two years, developing electro-mechanical modules of deployable braking flaps
- Developed an MPC-based autonomy stack for the rocket to reach a target altitude, involving C++ coding

Independent Research | Creative Engineering Project, IIT Madras **Fall 2017**

Project: *Autopilot flight controller board for multirotor UAVs* Advisor: Dr. Ranjith Mohan

- Designed and built a custom embedded autopilot board integrating microcontrollers and MEMS sensors for real-time control and stabilization, with low-level interfacing in RTOS and assembly language

Aerostructures Lead | Nimbus, IIT Madras competition team | SAE Aero Design 2017 **2016–17**

Project: *Design and fabrication of radio-controlled (RC) fixed-wing airplane* Fort Worth, TX

Recognition: Placed **12th** in world and **4th** in India, out of **75 teams globally**

- Carried out analysis of aerodynamic characteristics, stability, and performance of the RC aircraft
- Designed the aircraft structure using SolidWorks and manufactured using composites

Summer Intern | Flight Mechanics & Control Lab, NTU Singapore **Summer 2016**

Project: *Hardware design and manufacturing of tiltrotor bicopter experiment setup* | Advisor: Dr. Erdal Kayacan

- Designed a bicopter planform with dual-axis tilt, and a 3-axis articulated test rig using SolidWorks
- Fabricated the various prototypes using composites, additive manufacturing, and metal machining

PROFESSIONAL SERVICE AND LEADERSHIP

- **Academic and Professional Chair** at Graduate Student Advisory Committee (GSAC) of Aerospace Department, UMD College Park **2021–22**
- **Student representative in Executive Committee** of Maryland Robotics Center **2020–21**
- **Strategist and Mentor** for student-teams in **Robotics, Electronics & Aero Clubs** at the Centre for Innovation (CFI), IIT Madras **2016–18**