

RESEARCH INTERESTS Safe motion planning from a control-theoretic point of view; robust adaptive and nonlinear control theory; learning safety certificates and control policies; sampling-based motion planning; planning with reduced-order models; fast collision detection.

EDUCATION **Ph.D. Mechanical Science and Engineering** **Jan 2017 - May 2021(exp.)**
Advanced Controls Research Laboratory
Advisor: Naira Hovakimyan
University of Illinois at Urbana-Champaign, Urbana, IL.

M.S. Aerospace Engineering **Aug 2014 - Dec 2016**
University of Illinois at Urbana-Champaign, Urbana, IL.

B.Tech. Mechanical Engineering **July 2010 - May 2014**
VIT University, Vellore, India.

EMPLOYMENT **Facebook Reality Labs**, Redmond, WA. **May 2018 - Aug 2018**
Advisors: Douglas Lanman, Nick Colonnese
Research Intern

Paracosm/Occipital, Gainesville, FL. **May 2017 - Jul 2017**
Mentors: Jack Morrison, Quinn Martin
Robotics Perception Intern

Qualcomm Research, Philadelphia, PA. **May 2016 - Aug 2016**
Advisor: Matthew Turpin
Research Intern

TECHNICAL SUMMARY Proficiency of programming languages (from most to least comfortable): Julia, Matlab/Simulink, C++, C, Python. Extensive experience with robotics development on quadrotors and ground robots - typically this would involve a C++/C firmware stack, ROS/LCM communication middleware, and a Julia/Python/Simulink layer that handles the high-level decision making. The following are some of the open-source packages published on Github:

- **SafeFeedbackMotionPlanning.jl**: A Julia package for designing nonlinear controllers that ensure guaranteed performance in trajectory tracking problems.
- **CurveProximityQueries.jl**, **ConvexBodyProximityQueries.jl**: Packages that implements methods to compute proximity queries between convex bodies and/or parametric curves in 2/3D.
- **cf-firmware**: A firmware fork of the original Crazyflie repository that additionally implements geometric control, path following for trajectories, and handles control for attached manipulators.

PUBLICATIONS

$\mathcal{RL}_1 - \mathcal{GP}$: Safe simultaneous learning and control.

A. Gahlawat*, **A. Lakshmanan***, L. Song, A. Patterson, Z. Wu, N. Hovakimyan, and E. Theodorou. (*submitted to the Learning for Dynamics and Control (L4DC) Conference 2020*). <https://arxiv.org/pdf/2009.03864.pdf>

Safe feedback motion planning: A contraction theory and \mathcal{L}_1 -adaptive control based approach.

A. Lakshmanan*, A. Gahlawat*, and N. Hovakimyan. In *IEEE Conference on Decision and Control (CDC) 2020*, Dec 2020. <https://arxiv.org/pdf/2004.01142.pdf>

Intent-aware probabilistic trajectory estimation for collision prediction with uncertainty quantification.

A. Patterson, **A. Lakshmanan**, and N. Hovakimyan. In *IEEE Conference on Decision and Control (CDC) 2019*, Dec 2019. <https://ieeexplore.ieee.org/document/9029215>

Proximity queries for absolutely continuous curves.

A. Lakshmanan, A. Patterson, V. Cichella, and N. Hovakimyan. In *Proceedings of Robotics: Science and Systems (RSS)*, June 2019. <http://www.roboticsproceedings.org/rss15/p42.pdf>

Design and control of a small aerial manipulator for indoor environments.

R. M. Jones, D. Sun, G. B. Haberkamp, **A. Lakshmanan**, T. Marinho, and N. Hovakimyan. In *AIAA Information Systems-AIAA Infotech@ Aerospace*, Jan 2017. <https://arc.aiaa.org/doi/10.2514/6.2017-1374>

Piecewise Bézier curve trajectory generation and control for quadrotors. **A. Lakshmanan**. *Master's Thesis, University of Illinois at Urbana-Champaign*, Dec 2016. <https://www.ideals.illinois.edu/handle/2142/95352>

Carebots: Prolonged elderly independence using small mobile robots.

T. Marinho, C. Widdowson, A. Oetting, **A. Lakshmanan**, H. Cui, N. Hovakimyan, R. F. Wang, A. Kirlik, A. Laviers, and D. Stipanović. In *Mechanical Engineering, ASME*, Sep 2016. <https://asmedigitalcollection.asme.org/memagazineselect/article-pdf/138/09/S8/6359956/me-2016-sep5.pdf>

VR study of human-multicopter interaction in a residential setting.

T. Marinho, **A. Lakshmanan**, V. Cichella, C. Widdowson, H. Cui, R. M. Jones, B. Sebastian, and C. Goudeseune. In *2016 IEEE Virtual Reality (VR)*, Mar 2016. <https://ieeexplore.ieee.org/document/7504790>

*equal contribution