DAVID VAN WIJK

+1-(607)-280-0389 davidvanwijk@tamu.edu david-van-wijk https://davidvwijk.github.io/

EDUCATION

Texas A&M University (2021 - Expected August 2025)
Ph.D., Aerospace Engineering, Advisor: Prof. Manoranjan Majji
Thesis (Tentative): "Safety-Critical Control of Input-Constrained Autonomous Systems with Spacecraft Applications"

Cornell University (2017 - 2021)
B.S., Mechanical and Aerospace Engineering GPA: 3.83, *Magna Cum Laude*
Advisor: Prof. Silvia Ferrari

RESEARCH FOCUS AND SKILLS

I am a Ph.D. candidate passionate about developing **provably safe control algorithms for autonomous systems**. My research focuses on robotic and spacecraft applications, where I leverage insights from control theory, optimization, and estimation to enhance the reliability of autonomous operations in complex environments.

Research Interests: Safe autonomy, Control theory, Autonomous vehicles, Nonlinear systems
Programming Languages: Python, MATLAB, C++, Git, Java, LaTeX
Tools: Simscape Multibody, ANSYS, SolidWorks

PUBLICATIONS

UNDER REVIEW

R1. J. McElreath, **D. van Wijk**, M. Majji, "Controlling the Kalman Update: A Covariance Constrained Approach," *Under review for publication in IEEE Transactions on Aerospace and Electronic Systems (TAES)*, 2024.

JOURNAL PUBLICATIONS

J4. **D. van Wijk**, S. Coogan, T. G. Molnar, M. Majji, and K. L. Hobbs, "Disturbance-Robust Backup Control Barrier Functions: Safety Under Uncertain Dynamics," *IEEE Control Systems Letters (L-CSS)*, 2024. (link)

J3. I. Down, **D. van Wijk**, D. Parikh, M. Majji, "Autonomous Satellite Servicing Infrastructure for In-Space Assembly and Manufacturing," *ASME Journal of Manufacturing Science and Engineering, Special Issue on In-Space Manufacturing*, 2024. (link)

J2. **D. van Wijk**, K. Dunlap, M. Majji, and K. L. Hobbs, "Safe Spacecraft Inspection via Deep Reinforcement Learning and Discrete Control Barrier Functions," *AIAA Journal of Aerospace Information Systems (JAIS)*, 2024. (link)

J1. J. Gemerek, B. Fu, Y. Chen, Z. Liu, M. Zheng, **D. van Wijk**, S. Ferrari, "Directional Sensor Planning for Occlusion Avoidance," *IEEE Transactions on Robotics (T-RO)*, 2022. (link)

CONFERENCE PUBLICATIONS

C6. K. Dunlap, K. Bennett, **D. van Wijk**, N. Hamilton, K. L. Hobbs, "Run Time Assured Reinforcement Learning for Six Degree-of-Freedom Spacecraft Inspection," *AIAA ASCEND 2024*, July 2024. (link)

C5. **D. van Wijk**, I. Down, and M. Majji, "On-Manifold Collision Avoidance using Tori Parametrization and Control Barrier Functions," *Rocky Mountain AAS GN&C Conference*, Breckenridge, Colorado, USA, 1-7 February 2024.

C4. **D. van Wijk**, M. Majji, and K. L. Hobbs, "Fault Tolerant Run Time Assurance with Control Barrier Functions for Rigid Body Spacecraft Rotation," *AIAA SciTech 2024 Forum*, Orlando, Florida, USA, 7-12 January 2024. (link)

C3. **D. van Wijk**, K. Dunlap, M. Majji, and K. L. Hobbs, "Deep Reinforcement Learning for Autonomous Spacecraft Inspection using Illumination," *2023 AAS/AIAA Astrodynamics Specialist Conference*, Big Sky, Montana, USA, 13-17 August 2023. (link)

C2. K. Dunlap, **D. van Wijk**, and K. L. Hobbs, "Run Time Assurance for Autonomous Spacecraft Inspection," *AAS/AIAA Astrodynamics Specialist Conference*, Big Sky, Montana, USA, 13-17 August 2023. (link)

C1. **D. van Wijk**, K. Eves, and J. Valasek, "Deep Reinforcement Learning Controller for Autonomous Tracking of Evasive Ground Target," *AIAA SciTech 2023 Forum*, National Harbor, Maryland, USA, 23-27 January 2023. (link)

OTHER PUBLICATIONS

O1. **D. van Wijk**, "Stochastic Control Barrier Functions for Economics," *arXiv*, 2023. (link)

AWARDS AND HONORS

- **Texas A&M Graduate Excellence Fellowship Award**: Fall 2022, Fall 2023
- **Texas A&M Graduate Merit Fellowship**: 2021 – 2025
- **Cornell University Dean's List**: Spring 2018; Fall 2018; Spring 2019; Fall 2019; Fall 2020; Spring 2021

OUTREACH AND MENTORSHIP

- **Camp SOAR Outreach** (2022, 2023): Led laboratory tours and demonstrations for high school students interested in STEM.
- **Texas A&M Physics Festival** (2022, 2023): Led demonstrations for students K-12 to inspire the next generation of STEM students.
- **Mentored Haru Tidmore (M.S. Student)**: Provided technical support and guidance to master's student on topic of multi-body dynamics modeling and control of 7-DOF manipulator mounted to free-flying spacecraft.

PROFESSIONAL SERVICE

- **Session Chair**: *AAS/AIAA Astrodynamics Specialist Conference 2023*, led and organized four technical sessions.
- **Reviewer**: *IEEE Control Systems Letters* (2), *IEEE American Control Conference 2025* (2), *AIAA Journal of Guidance, Control, and Dynamics* (1), *AIAA Journal of Aerospace Information Systems* (3), *Journal of the Astronautical Sciences* (1), *AIAA SciTech Conference 2024* (5), *AIAA Ascend 2024* (3)

INVITED TALKS

I1. "Fault Tolerant Run Time Assurance with Control Barrier Functions for Rigid Body Spacecraft Rotation." *Air Force Research Laboratory, Safe Trusted Autonomy for Responsible Spacecraft Annual Review.* October 2023.

SELECT RESEARCH EXPERIENCE

Safe Autonomy for Spacecraft Control (Aug '22 - Current)
Research Internship with Dr. Kerianne Hobbs, Air Force Research Laboratory (AFRL), Safe Autonomy Team
Trained reinforcement learning agents for autonomous rendezvous, proximity operations, and docking (ARPOD) scenarios, and developed control barrier function based run-time assurance algorithms to guarantee safety of those agents. (J2, C6, C4, C3, C2)

Simulation and Control of 7-DOF Spacecraft Manipulator (Aug '23 - Jan '24)
Graduate Research with Arkisys and Prof. Manoranjan Majji, Texas A&M University
Developed and validated a control system and manipulator planning system for 7-DOF robotic arm mounted on free-flying spacecraft using MATLAB Simulink and Simscape Multibody.

Spacecraft Manuever Classification using ML (Jan '23 - May '23)
Graduate Research with Ten One Aerospace, LLC and Prof. Manoranjan Majji, Texas A&M University
Built simulation of ground sensor and spacecraft dynamics to perform machine learning (ML) analysis for learning maneuver intent from ground sensor image traces.

Path Planning for Autonomous Drone (Jun '19 - May '21)
Undergraduate Research with Prof. Silvia Ferrari, Cornell University
Implemented and flight-tested custom algorithms for path planning in the presence of obstacles for an autonomous drone in occluded environments. (J1)

RELEVANT GRADUATE COURSEWORK

Optimal Control; Nonlinear Control; Intelligent Systems and Robotics; Estimation of Dynamic Systems; Intuitive Robotic Mechanisms; Artificial Intelligence; Spacecraft Dynamics & Control; Intelligent Sensor Planning & Control

REFERENCES

Dr. Manoranjan Majji, Professor of Aerospace Engineering, Texas A&M University — contact: `mmajji@tamu.edu`

Dr. Kerianne Hobbs, Safe Autonomy Lead, Air Force Research Laboratory — contact: `kerianne.hobbs@afrl.af.mil`