

# DAVID E. J. VAN WIJK, PH.D.

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## CURRENT POSITION

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### California Institute of Technology

(August 2025 – Current)

*Postdoctoral Scholar, Mechanical & Civil Engineering*

Advisor: Prof. [Joel Burdick](#)

## EDUCATION

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### Texas A&M University

(2021 – August 2025)

*Ph.D., Aerospace Engineering*

Advisor: Prof. [Manoranjan Majji](#)

Dissertation: “Safety-Critical Control of Input-Constrained Systems”

### Cornell University

(2017 – 2021)

*B.S., Mechanical & Aerospace Engineering*

*Magna Cum Laude*

Advisor: Prof. [Silvia Ferrari](#)

## RESEARCH FOCUS AND SKILLS

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I am a postdoctoral scholar passionate about developing **provably safe control algorithms for autonomous systems**. I am interested in problems which merge 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, State estimation

**Programming Languages:** Python, MATLAB, C++, Git, Java, LaTeX

**Tools:** Simscape Multibody, ANSYS, SolidWorks

## PUBLICATIONS

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\* indicates equal contribution

### UNDER REVIEW

- R1. **D. E. J. van Wijk**, E. Daş, A. Alan, S. Coogan, T. G. Molnar, J. W. Burdick, M. Majji, K. L. Hobbs, “Uncertainty Estimators for Robust Backup Control Barrier Functions,” *Submitted to Automatica*, 2025. ([link](#))
- R2. **D. E. J. van Wijk**, E. Daş, T. G. Molnar, A. D. Ames, J. W. Burdick, “Safety-Critical Control with Bounded Inputs: A Closed-Form Solution for Backup Control Barrier Functions,” *Submitted to American Control Conference (ACC)*, 2026. ([link](#))

### JOURNAL PUBLICATIONS

- J5. J. McElreath, **D. E. J. van Wijk**, M. Majji, “Controlling the Kalman Update: A Covariance Constrained Approach,” *IEEE Transactions on Aerospace and Electronic Systems (TAES)*, 2025. ([link](#))
- J4. **D. E. J. 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. E. J. 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. E. J. 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. E. J. van Wijk**, S. Ferrari, “Directional Sensor Planning for Occlusion Avoidance,” *IEEE Transactions on Robotics (T-RO)*, 2022. ([link](#))

### CONFERENCE PUBLICATIONS

- C8. **D. E. J. van Wijk**, S. Coogan, T. G. Molnar, M. Majji, and K. L. Hobbs, “Disturbance-Robust Backup Control Barrier Functions: Safety Under Uncertain Dynamics,” *Proceedings of the American Control Conference (ACC)*, Denver, Colorado, USA, 8-10 July 2025. ([link](#))
- C7. D. Parikh\*, **D. E. J. van Wijk\***, M. Majji, “Safe Multi-agent Satellite Servicing with Control Barrier Functions,” *Proceedings of the Rocky Mountain AAS GN&C Conference*, Breckenridge, Colorado, USA, 1-5 February 2025. ([link](#))

- C6. K. Dunlap, K. Bennett, **D. E. J. van Wijk**, N. Hamilton, K. L. Hobbs, “Run Time Assured Reinforcement Learning for Six Degree-of-Freedom Spacecraft Inspection,” Proceedings of the *AIAA ASCEND Conference*, July 2024. ([link](#))
- C5. **D. E. J. van Wijk**\*, I. Down\*, and M. Majji, “On-Manifold Collision Avoidance using Tori Parametrization and Control Barrier Functions,” Proceedings of the *Rocky Mountain AAS GN&C Conference*, Breckenridge, Colorado, USA, 1-7 February 2024.
- C4. **D. E. J. van Wijk**, M. Majji, and K. L. Hobbs, “Fault Tolerant Run Time Assurance with Control Barrier Functions for Rigid Body Spacecraft Rotation,” Proceedings of the *AIAA SciTech Forum*, Orlando, Florida, USA, 7-12 January 2024. ([link](#))
- C3. **D. E. J. van Wijk**, K. Dunlap, M. Majji, and K. L. Hobbs, “Deep Reinforcement Learning for Autonomous Spacecraft Inspection using Illumination,” Proceedings of the *AAS/AIAA Astrodynamics Specialist Conference*, Big Sky, Montana, USA, 13-17 August 2023. ([link](#))
- C2. K. Dunlap, **D. E. J. van Wijk**, and K. L. Hobbs, “Run Time Assurance for Autonomous Spacecraft Inspection,” Proceedings of the *AAS/AIAA Astrodynamics Specialist Conference*, Big Sky, Montana, USA, 13-17 August 2023. ([link](#))
- C1. **D. E. J. van Wijk**, K. Eves, and J. Valasek, “Deep Reinforcement Learning Controller for Autonomous Tracking of Evasive Ground Target,” Proceedings of the *AIAA SciTech Forum*, National Harbor, Maryland, USA, 23-27 January 2023. ([link](#))

## OTHER PUBLICATIONS

- O1. **D. E. J. van Wijk**, “Stochastic Control Barrier Functions for Economics,” *arXiv preprint*, 2023. ([link](#))

## AWARDS AND HONORS

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- **Texas A&M Graduate Excellence Fellowship Award (Fall 2022, Fall 2023)**: Open and highly competitive fellowship award of \$1000, selected by the Texas A&M Department of Aerospace Engineering Graduate Program Committee.
- **Texas A&M Graduate Merit Fellowship (2021 – 2025)**: Highly competitive fellowship awarded to a single student in the Aerospace Engineering department per year.
- **Cornell University Dean’s List**: Spring 2018; Fall 2018; Spring 2019; Fall 2019; Fall 2020; Spring 2021

## OUTREACH AND MENTORSHIP

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- **Camp SOAR Outreach** (2022, 2023): Led laboratory tours and demonstrations for high school students interested in STEM.
- **Texas A&M Physics Festival** (2022, 2023, 2024): Led demonstrations for students K-12 to inspire the next generation of STEM students.

## PROFESSIONAL SERVICE

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

## INVITED TALKS

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- I3. “Safety-Critical Control with Bounded Inputs.” *46th Southern California Control Workshop, UC Irvine*. October 2025.
- I3. “Safety-Critical Control of Input-Constrained Systems.” *California Institute of Technology*. April 2025.
- I2. “Safety-Critical Control of Input-Constrained Systems.” *Princeton University*. April 2025.
- 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

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### Safe Autonomy for Spacecraft Control

(Aug ‘22 – Aug ‘25)

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. (J4, 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 Maneuver 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

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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

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**Dr. Joel W. Burdick**, Professor of Mechanical Engineering and Bioengineering; Jet Propulsion Laboratory Research Scientist, California Institute of Technology — contact: [jburdick@caltech.edu](mailto:jburdick@caltech.edu)

**Dr. Aaron D. Ames**, Professor of Mechanical and Civil Engineering, Control and Dynamical Systems, and Aerospace, California Institute of Technology — contact: [ames@caltech.edu](mailto:ames@caltech.edu)

**Dr. Manoranjan Majji**, Professor of Aerospace Engineering, Texas A&M University — contact: [mmajji@tamu.edu](mailto:mmajji@tamu.edu)

**Dr. Kerianne L. Hobbs**, Senior Engineering Specialist, Vehicle Autonomy & System Trust, The Aerospace Corporation — contact: [kerianne.hobbs@aero.org](mailto:kerianne.hobbs@aero.org)

**Dr. Dylan A. Shell**, Professor of Computer Science and Engineering, Texas A&M University — contact: [dshell@tamu.edu](mailto:dshell@tamu.edu)