

Adam R. Gerlach

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Innovative | Interdisciplinary | Impactful

Experience

Air Force Research Laboratory

SENIOR RESEARCH AEROSPACE ENGINEER

WPAFB, OH

Jan 2020 — Present

- Led the ideation, planning and technical execution of research, development, and test initiatives to provide long-term mission impact
- Managed a multidisciplinary international team of researchers, ensuring aggressive technical, schedule, and financial goals were met
- Spearheaded AFRL's first approved cloud computing R&D project, demonstrating actionable research results in hours vs. months
 - Enabled the development of AFRL's current Google Workspace and CloudLab services used over 12k users.
- Developed autonomy technologies for decision making and optimization under uncertain and incomplete information
 - Enabled improved system performance and risk management
 - Extended the real-world viability of autonomous systems in complex environments

RESEARCH AEROSPACE ENGINEER

Feb 2016 — Jan 2020

- Transformed cargo delivery mission planning by developing mission-specific planning criterion, methodologies, and risk measures
- Led a successful multiyear cargo delivery flight-test campaign that met all technical, schedule, and cost objectives
- Negotiated no-cost R&D agreements with industry partners to develop, build, and test low-cost, high-precision cargo delivery systems

Universal Technology Corporation

RESEARCH ENGINEER (ON-SITE CONTRACTOR, AIR FORCE RESEARCH LABORATORY)

Dayton, OH

Jan 2014 — Feb 2016

- Developed a high performance cargo delivery optimization algorithm, enabling low-cost, real-time embedded application
- Identified innovative ways to plan cargo delivery, leading to improved accuracy and reliability at no additional cost

RESEARCH ENGINEER (ON-SITE CONTRACTOR AIR FORCE RESEARCH LABORATORY)

Summer 2013

- Developed path planning/tracking algorithms and simulation tools to support the needs of the Unmanned Air Vehicle team in the Aerospace Systems Directorate as part of the Short Term Aerospace Research & Development Program

Intellimed Systems

CHIEF TECHNOLOGY OFFICER

Cincinnati, OH

May 2010 — Jan 2014

- Managed and led an interdisciplinary team of engineers and designers developing, building, and testing a novel medical imaging device
- Developed the end-to-end product software stack including the database, image and data processing, UX, and hardware integration
- Designed a human-machine interface for data change inspection aligned with a human's natural perception, reducing false positives

University of Cincinnati

GRADUATE RESEARCH ASSISTANT

Cincinnati, OH

2007-2014

- Designed closed-form methods for waypoint navigation in high dimensional spaces, enabling real-time in-flight performance
- Developed near real-time visual position and orientation estimation algorithms for autonomous satellite servicing application
- Developed a surgical robotic/vision system that performs the milling operations required for the insertion of cochlear implants

Robotics Research Corporation

COMPUTER VISION CONSULTANT

Blue Ash, OH

Summer 2010

- Researched and evaluated robotic vision systems for an automated shipboard palletizing application for the US Navy
- Performed a top-level development of novel algorithms that enabled the adaptation of commercial robotic vision systems to an automated shipboard mixed load palletizing application in order to reduce hardware development time and cost

COMPUTER VISION CONSULTANT

Summer 2007

- Designed, programmed, and tested a vision tracking and recognition system for aiding an autonomous ground vehicle in navigating urban combat zones for the US Army

Naval Research Laboratory

PROPULSION ENGINEER

Washington, DC

2004-2007

- Assisted in the design, development, analysis, build, test, and flight operations of an experimental upper stage propulsion system

- Designed a suite of spacecraft component and system data acquisition and control modules as part of a \$600K facility test and development upgrade
- Developed mathematical models for determining fuel consumption and vehicle performance during flight operations required for maneuver planning and orbit determination

Praxis, Inc.

PROPULSION ENGINEER (ON-SITE NAVAL RESEARCH LABORATORY)

Alexandria, VA

2004

- Developed software tools for post-processing spacecraft flight performance data

Honors & Awards

Professional

2024	Letter of Commendation , Chief Scientist, Aerospace Systems Directorate, Air Force Research Laboratory	WPAFB, OH
2023	Best Presentation Award , Aerospace Control and Guidance Systems Committee	Missoula, MT
2022	Innovation Award , Aerospace Systems Directorate, Air Force Research Laboratory	WPAFB, OH
2020	Technology Transfer & Transition Award , Aerospace Systems Directorate, Air Force Research Laboratory	WPAFB, OH
2017	Innovation Award , Air Force Research Laboratory	WPAFB, OH
2016	General Benjamin D. Foulois Award , Aerospace Systems Directorate, Air Force Research Laboratory	WPAFB, OH
2016	Innovation Award , Aerospace Systems Directorate, Air Force Research Laboratory	WPAFB, OH
2016	Jr. Scientist and Engineer of the Quarter , Aerospace Systems Directorate, Air Force Research Laboratory	WPAFB, OH
2006	Certificate of Recognition , DARPA	Washington, DC
2006	Effort and Achievement Memorandum , Space Propulsion Section, NRL	Washington, DC
2005	Special-Act Award , NRL	Washington, DC

Acedemic

2010	Doctoral Fellowship , NASA Ohio Space Grant Consortium	Cleveland, OH
2007	Masters Fellowship , NASA Ohio Space Grant Consortium	Cleveland, OH
2007	Rensburg Fellowship , Aerospace Department, University of Cincinnati	Cincinnati, OH
2007	Bradley Jones Memorial Award , Aerospace Department, University of Cincinnati	Cincinnati, OH

Education

University of Cincinnati

DOCTOR OF PHILOSOPHY, AEROSPACE ENGINEERING

Major: Controls and Dynamics | Minor: Intelligent Systems

Cincinnati, OH

Mar 2010 — Apr 2014

MASTERS OF SCIENCE, AEROSPACE ENGINEERING

Major: Controls and Dynamics | Minor: Robotics

Sep 2007 — Mar 2010

BACHELOR OF SCIENCE, AEROSPACE ENGINEERING

Sep 2002 — Jun 2007

Skills & Interests

Skills	Innovation, Algorithm Development, High-Performance Scientific Computing, Communicating
Software	Julia, Python, MATLAB, Simulink, C++, GPGPU, Git, DevOps, SolidWorks, Linux
Interests	Woodworking, Leathercrafting, Bushcrafting, Rucking, Reading, Spending time with family

Invited Lectures

National Center for Atmospheric Research

UNCERTAINTY PROPAGATION AND PROBABILISTIC PLANNING FOR PRECISION AIRDROP OPERATIONS: A SERIES OF SHORT TALKS

Boulder, CO

2017

University of Saint Francis, Sciences Department

ECTOscan™: ASSESSING AND TRACKING INFLAMMATION BETTER, FASTER, AND CHEAPER

Fort Wayne, IN

2012

Patents

Doman, D. B., **Gerlach, A.**, & Vandermeij, J. T. (2019). *Apparatus and Method for Precision Ballistic Airdrop*.

Thomson, P. E., **Gerlach, A.**, & Smith, M. F. (2017). *Scanning System and Display for Aligning 3D Images with Each Other and/or for Detecting and Quantifying Similarities or Differences between Scanned Images*.

Gerlach, A., Thomson, P., & Walker, B. (2017). *Surface Data Acquisition, Storage, and Assessment System*.

Publications

Journal Articles

- Utkarsh, U., Churavy, V., Ma, Y., Besard, T., Srisuma, P., Gymnich, T., **Gerlach, A.**, Edelman, A., Barbastathis, G., Braatz, R. D., & Rackauckas, C. (2024). Automated Translation and Accelerated Solving of Differential Equations on Multiple GPU Platforms. *Computer Methods in Applied Mechanics and Engineering*, 419, 116591. <https://doi.org/10.1016/j.cma.2023.116591>
- Meyers, J., Rogers, J., & **Gerlach, A.** (2021). Koopman Operator Method for Solution of Generalized Aggregate Data Inverse Problems. *J. Comput. Phys.*, 428(110082), 110082. <https://doi.org/10.1016/j.jcp.2020.110082>
- Leonard, A., Rogers, J., & **Gerlach, A.** (2020). Probabilistic Release Point Optimization for Airdrop with Variable Transition Altitude. *Journal of Guidance, Control, And Dynamics*, 43(8), 1487–1497. <https://doi.org/10.2514/1.G004959>
- Leonard, A., Rogers, J., & **Gerlach, A.** (2019). Koopman Operator Approach to Airdrop Mission Planning Under Uncertainty. *J. Guid. Control Dyn.*, 42(11), 2382–2398. <https://doi.org/10.2514/1.G004277>
- Leonard, A., Klein, B., Jumonville, C., Rogers, J., **Gerlach, A.**, & Doman, D. (2017). Probabilistic Algorithm for Ballistic Parachute Transition Altitude Optimization. *Journal of Guidance, Control, And Dynamics*, 40(12), 3037–3049. <https://doi.org/10.2514/1.G002243>
- Gerlach, A.**, & Doman, D. B. (2016). Analytical Solution for Optimal Drogue-to-Main Parachute Transition Altitude for Precision Ballistic Airdrops. *Journal of Guidance, Control, And Dynamics*, 40(2), 439–452. <https://doi.org/10.2514/1.G001824>
- VanderMey, J. T., Doman, D. B., & **Gerlach, A.** (2015). Release Point Determination and Dispersion Reduction for Ballistic Airdrops. *Journal of Guidance, Control, And Dynamics*, 38(11), 2227–2235. <https://doi.org/10.2514/1.G001157>

Conference Papers

- Gerlach, A.** (2024). Simultaneous Planar Path Planning and Vector Field Generation via Interpolating Implicit Surfaces. *AIAA SciTech Forum*.
- Utkarsh, U., Churavy, V., Ma, Y., Besard, T., Srisuma, P., Gymnich, T., **Gerlach, A.**, Edelman, A., Barbastathis, G., Braatz, R. D., & Rackauckas, C. (2023). Automated Translation and Accelerated Solving of Differential Equations on Multiple GPU Platforms. *Supercomputing 23*, 419, 116591. <https://doi.org/10.1016/j.cma.2023.116591>
- Schierman, J. D., **Gerlach, A.**, & Doman, D. B. (2023). Explicit Uncertainty Quantification for Systems with Parametric Uncertainty. *AIAA SCITECH2023 Forum*. <https://doi.org/10.2514/6.2023-1096>
- Bak, S., Bogomolov, S., Duggirala, P. S., **Gerlach, A.**, & Potomkin, K. (2021). Reachability of Black-Box Nonlinear Systems after Koopman Operator Linearization. *7th IFAC Conference on Analysis and Design of Hybrid Systems*, 253–258.
- Berneburg, J. A., Garcia, E., **Gerlach, A.**, Casbeer, D., & Nowzari, C. (2020). Strongly Non-Zeno Event-Triggered Wireless Clock Synchronization. *21st IFAC World Congress*, 53, 2745–2750. <https://doi.org/10.1016/j.ifacol.2020.12.928>
- Wilhelm, J., Clem, G., Casbeer, D., & **Gerlach, A.** (2019). Circumnavigation and Obstacle Avoidance Guidance for UAVs Using Gradient Vector Fields. *AIAA Scitech2019 Forum*.
- Meyers, J. J., Leonard, A. M., Rogers, J. D., & **Gerlach, A.** (2019). Koopman Operator Approach to Optimal Control Selection Under Uncertainty. *2019 American Control Conference (ACC)*, 2964–2971. <https://doi.org/10.23919/ACC.2019.8814461>
- Rogers, J. D., Leonard, A., Jumonville, C., **Gerlach, A.**, & Doman, D. (2017). Shaping Dispersion Patterns in Complex Dropzones Through Parachute Transition Altitude Optimization. *24th AIAA Aerodynamic Decelerator Systems Technology Conference*. <https://doi.org/10.2514/6.2017-3392>
- Leonard, A., Rogers, J. D., **Gerlach, A.**, & Doman, D. (2017). A Probabilistic Approach to the Optimal Determination of a Computed Air Release Point. *24th AIAA Aerodynamic Decelerator Systems Technology Conference*. <https://doi.org/10.2514/6.2017-3223>
- Gerlach, A.**, Doman, D., Rogers, J. D., & Leonard, A. (2017). Probabilistic Airdrop Planning for Dynamic Drop Zones. *24th AIAA Aerodynamic Decelerator Systems Technology Conference*. <https://doi.org/10.2514/6.2017-3224>
- Gerlach, A.**, Doman, D., Henry, M., & Patel, S. (2017). Characterizing the Performance of Transition Altitude Optimization for High Altitude-Low Opening Ballistic Airdrop. *24th AIAA Aerodynamic Decelerator Systems Technology Conference*. <https://doi.org/10.2514/6.2017-3221>
- VanderMey, J. T., Doman, D. B., & **Gerlach, A.** (2016). Release Point Determination and Dispersion Reduction for Ballistic Airdrops. *AIAA SciTech Forum*. <https://doi.org/10.2514/6.2016-1537>
- Gerlach, A.**, & Doman, D. B. (2016). Wind Field Estimation From Airdrop Trajectory Measurements. *AIAA Guidance, Navigation, And Control Conference*. <https://doi.org/10.2514/6.2016-1616>
- Gerlach, A.**, Manyam, S. G., & Doman, D. B. (2016). Precision Airdrop Transition Altitude Optimization via the One-in-a-Set Traveling Salesman Problem. *2016 American Control Conference (ACC)*, 3498–3502. <https://doi.org/10.1109/ACC.2016.7525455>
- Gerlach, A.**, & Doman, D. B. (2016). Analytical Solution for Optimal Drogue-to-Main Parachute Transition Altitude for Ballistic Airdrops. *AIAA Guidance, Navigation, And Control Conference*. <https://doi.org/10.2514/6.2016-0868>
- Gerlach, A.**, Kingston, D., & Walker, B. K. (2014). UAV Navigation Using Predictive Vector Field Control. *2014 American Control Conference*, 4907–4912. <https://doi.org/10.1109/ACC.2014.6859082>

- Gerlach, A.,** & Walker, B. K. (2013). Trajectory Tracking by Approximate Inverse Dynamics: IDRBF Computational Considerations. *AIAA Infotech@Aerospace (I@A) Conference*. <https://doi.org/10.2514/6.2013-4573>
- Gerlach, A.,** & Walker, B. K. (2013). Directly Controlling the Sparsity of an Interpolation Matrix Formed by Compactly Supported RBFNs. *AIAA Infotech@Aerospace (I@A) Conference*. <https://doi.org/10.2514/6.2013-5061>
- Gerlach, A.,** & Walker, B. K. (2013). Trajectory Tracking by Approximate Inverse Dynamics: An Introduction to the IDRBF Algorithm. *Guidance, Navigation, And Control and Co-located Conferences*. <https://doi.org/10.2514/6.2013-4572>
- Gerlach, A.,** & Walker, B. (2012). Accelerating Robust 3D Pose Estimation Using C*-Images. *50th AIAA Aerospace Sciences Meeting Including the New Horizons Forum and Aerospace Exposition*. <https://doi.org/10.2514/6.2012-602>
- Gerlach, A.,** & Walker, B. K. (2011). Accelerating Robust 3D Pose Estimation Utilizing a Graphics Processing Unit. *Proc. SPIE 7878, Intelligent Robots and Computer Vision XXVIII: Algorithms and Techniques*, 7878, 78780. <https://doi.org/10.1117/12.876713>
- Netwall, C., Osborn, M., Clauss, C., & **Gerlach, A.** (2007). Transient Pressure Analysis and Verification Testing for the Micro-satellite Technology Experiment Upper Stage Propulsion System. *43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit*. <https://doi.org/10.2514/6.2007-5523>

Theses

- Gerlach, A.** (2014). *Autonomous Path-Following by Approximate Inverse Dynamics and Vector Field Prediction*.
- Gerlach, A.** (2010). *Performance Enhancements of the Spin-Image Pose Estimation Algorithm*.

Advised Theses

- Meyers, J. (2022). *Koopman Operator Approach to Uncertainty Quantification and Decision-Making*.
- Leonard, A. (2019). *Probabilistic Methods for Decision Making in Precision Airdrop*.