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EDUCATION

California Institute of Technology <i>Ph.D. in Control and Dynamical Systems</i>	Pasadena, CA 2002
University of Arizona <i>B.S. in Mathematics</i>	Tucson, AZ 1997

EMPLOYMENT

Northwestern University <i>Professor</i>	2009-present
<i>Associate Professor</i>	2017 - present
<i>Assistant Professor</i>	2009-2011
University of Colorado at Boulder <i>Assistant Professor</i>	2004-2008
Aerospace Corporation <i>Senior Technical Staff</i>	2003-2004
Northwestern University <i>Postdoctoral Scholar</i>	2002-2003

PUBLICATIONS¹ AND SOFTWARE

Journal Articles

- [74] M. Schlaflly, A. Prabhakar, K. Popovic, G. Schlaflly, C. Kim, and T. D. Murphey, “Shared coverage control for human-swarm collaboration under pressure,” *PNAS Nexus*, vol. 3, no. 2, p. pgae016, 2024.
- [73] T. Fan and T. D. Murphey, “Majorization minimization methods for distributed pose graph optimization,” *IEEE Transactions on Robotics*, vol. 40, pp. 22–42, 2024.
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- [71] T. Berrueta, T. D. Murphey, and R. Truby, “Materializing autonomy in soft robots across scales,” *Advanced Intelligent Systems*, p. 2300111, 2023.

¹Reprints of many of these can be found at murpheylab.github.io

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- [69] A. Pinosky, I. Abraham, A. Broad, B. Argall, and T. D. Murphey, “Hybrid control for combining model-based and model-free reinforcement learning,” *International Journal of Robotics Research*, vol. 42, no. 6, pp. 337–355, 2023.
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- [66] A. Kalinowska, M. Schlaflly, K. Rudy, J. P. A. Dewald, and T. D. Murphey, “Measuring interaction bandwidth during physical human-robot collaboration with and without haptic stimuli,” *IEEE Robotics and Automation Letters*, vol. 7, no. 4, pp. 12467–12474, 2022.
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- [64] W. Jin, T. D. Murphey, D. Kulic, N. Ezer, and S. Mou, “Learning from sparse demonstrations,” *IEEE Transactions on Robotics*, vol. 39, no. 1, pp. 645–664, 2022.
- [63] W. Jin, T. D. Murphey, Z. Lu, and S. Mou, “Learning from human directional corrections,” *IEEE Transactions on Robotics*, vol. 39, no. 1, pp. 625–644, 2022.
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- [43] T. Berrueta, A. Pervan, K. Fitzsimons, and T. Murphey, “Dynamical system segmentation for information measures in motion,” *IEEE Robotics and Automation Letters*, vol. 4, no. 1, pp. 169–176, 2019.
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- [144] A. Kalinowska, E. Davoodi, K. W. Mathewson, T. Murphey, and P. M. Pilarski, "Communication emergence in a goal-oriented environment: Towards situated communication in multi-step interactions," in *Conference on Reinforcement Learning and Decision Making (RLDM)*, 2022.
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- Todd D. Murphey (PI). National Science Foundation–National Robotics Initiative: *Task-Based Assistance for Software-Enabled Biomedical Devices*. \$430,000, 09/2021-08/2021.
- Mitra Hartmann (PI), Todd Murphey, John Rudnicki, Sara Solla. National Institutes of Health: *Coding properties of Vibrissal-Responsive Trigeminal Ganglion Neurons*. \$1,800,000, 07/2015-06/2021.
- Todd D. Murphey (PI), Eva Kanso, Yasamin Mostofi, Evangelos Theodorou. Army Research Office: *Study Proposal: Transforming Terrestrial Agility At All Scales*. \$60,000.
- Todd D. Murphey. Army Research Office: *Ergodic Control for Optimal Information Acquisition*. \$360,000.
- Todd D. Murphey (PI, 50%), J. Edward Colgate (Co-PI, 50%). National Science Foundation–National Robotics Initiative: *Autonomous Synthesis of Haptic Languages*. \$585,000.
- Malcolm A. MacIver (PI, 40%), Michael Peshkin (Co-PI, 30%), Todd D. Murphey (Co-PI, 30%). Office of Naval Research: *A Bio-Inspired Underwater Robot for Station Keeping with Omnidirectional Disturbances*. \$1,000,000.
- Todd D. Murphey (PI, 35%), Brenna Argall (Co-PI, 35%), and Magnus Egerstedt (Co-PI, 30%). National Science Foundation–Cyber-Physical Systems: *Collaborative Research: Mutually stabilized correction in physical demonstration*. \$1,000,000.
- Todd D. Murphey (PI, 50%) and Melvin Leok (Co-PI, 50%). National Science Foundation–Civil and Mechanical Systems: *Ergodic Trajectories in Discrete Mechanics*. \$430,000.
- Todd D. Murphey. National Institute of Health–R24: *Exoskeleton Evaluation for Hemiplegia Therapy*. \$50,000.
- Todd D. Murphey. National Science Foundation–Civil and Mechanical Systems: *Physical Design and Feedback Control of Hybrid Mechanical Systems*. \$350,000.
- Kevin Lynch (PI), Brenna Argall, J. Edward Colgate, Todd D. Murphey, and Ying Wu (Co-PIs). National Science Foundation: *MRI: Equipment Development: Bimanual Robotic Manipulation and Sensory Workspace*. \$400,000.
- Todd D. Murphey (PI, 50%) and Kevin Lynch (Co-PI, 50%). National Science Foundation–Robust Intelligence: *Hierarchical Planning, Estimation, and Control for Hybrid Mechanical Systems*. \$450,000.
- W. Murray (PI, 50%), T. D. Murphey (Co-PI, 50%), National Institutes of Health: *Prosthesis Control by Forward Simulation of the Intact Biomedical System*. (Northwestern portion) \$550,000.
- Todd D. Murphey (Consultant to Kinea, 10%) DARPA: *SBIR Phase I: Tactile Detection Robotic Hand System*. Murphey’s portion is \$10,000
- Todd D. Murphey (PI, 50%) and Magnus Egerstedt (Co-PI, 50%). National Science Foundation–CreativeIT: *Collaborative Research: Major: Puppet Choreography and Automated Marionettes*. \$800,000.
- Magnus Egerstedt (Co-PI, 50%) and Todd D. Murphey (PI, 50%). National Science Foundation–Software for Real-World Systems: *Collaborative Proposal: Abstraction-Based Motion Programs for Complex, Interconnected Systems*. \$450,000.

- Lucy Y. Pao (PI, 50%) and Todd D. Murphey (Co-PI, 50%). Air Force Research Laboratory: *Data Association and Sensor Management Algorithms for Tracking Applications*. \$250,000.
- Todd D. Murphey. National Science Foundation–Advanced Learning Technology: *Assessment of Controls Laboratory*. \$24,591.
- Todd D. Murphey. National Science Foundation–Civil and Mechanical Systems: *CAREER: Planning and Control for Overconstrained Mechanisms*. \$400,000.

TEACHING

Teaching Highlights

- Northwestern University Cole-Higgins Award for Excellence in Teaching (2015)
- Northwestern University Charles Deering McCormick Professor of Teaching Excellence (2014)
- Northwestern University Cole-Higgins Award for Excellence in Advising (2013)
- Participant in National Academy of Engineering Frontiers of Engineering Education Symposium (2009)

Coursera

2013-2014, www.coursera.org

- Created and taught course: *Everything Is The Same: Modeling Engineered Systems*

International Centre for Mechanical Sciences (CISM)

2013, Udine, Italy

- Lecturer for *Differential-Geometric Methods in Computational Multibody Systems*. (My portion of the lectures focused on engineering applications of structured integration and optimal control in the context of structured integration.)

Northwestern University

2009-present, Evanston, IL

- Created and taught course: *Theory of Machines: Dynamics ME 314* (2009-present)
- Created and taught course: *Active Learning in Robotics, ME 455* (2018-present)
- Taught course: *Systems Dynamics, EA-3* (2009-2019)
- Created and taught course: *Introduction to Optimal Control, ME 454* (2009-2017)
- Created and taught course: *Stochastic Systems in Robotics* (Spring, 2011)

PROFESSIONAL ACTIVITIES

Service Highlights

- Member: Air Force Scientific Advisory Board (2019-present)
 - Chair: FY23 study *Assessing Advanced Aerospace Mobility Concepts*
 - Chair: FY21 AFRL Autonomy and Artificial Intelligence review
 - Vice-Chair: FY20 AFRL-RH review
 - Co-Vice-Chair: FY20 study *21st Century Training and Education Technologies*
- IEEE service
 - Vice President: IEEE RAS Publication Activities Board (2022-present)
 - Member: IEEE RAS Education Committee (2021-present)
 - Member: IEEE RAS Section Chapter of the Year Award committee (2021)

- Member: IEEE RAS ad hoc Committee to Explore Synergies in Automation and Robotics (CESAR) (2021-present)
- Senior Editor for *IEEE Transactions on Robotics* (2014-2018)
- Associate Editor for *IEEE Transactions on Automation Science and Engineering* (2010-2014)
- Associate Editor for *IEEE Transactions on Robotics* (2008-2012)
- Member: National Academies' Board on Army Research and Development: Artificial Intelligence and Justified Confidence: A Workshop (2022)
- Member: US Army Virtual Workshop: "Manned-Unmanned Teaming: Projected Scientific Breakthroughs in 2026-2031" (2022)
- Member: National Academies / National Research Council Committee on Counter-Unmanned Aircraft System (CUAS) Capability for Battalion-and-Below Operations (2016-2018)
- Presenter for Coalition for the National Science Foundation (CNSF) Capitol Hill Exhibition (2017)
- Member: Northwestern University Task Force on the Undergraduate Academic Experience (2015)
- Defense Science Study Group (DSSG)—one of fifteen scientists/engineers nationwide selected to participate in the DARPA/IDA DSSG for the two year program in 2014-2015
- Invited speaker on Massive Open Online Courses (MOOCs) in universities for National Academy of Engineering Frontiers of Engineering Education Symposium in 2013

University Service

- Member: Center for Advancing Safety of Machine Intelligence (CASMI) Governance Advisory Committee (2021-present)
- Segal Fellow (2021-present)
- Member: RAC Retail Robotics Advisory Board (2018-2022)
- Chair: Northwestern University Faculty Distance Learning Workgroup (2015 - 2018)
- Director and Co-Founder of Master of Science in Robotics Program (2013-present)
- Member: Northwestern University Segal Design Institute Research Council
- Member: Feinberg School of Medicine DPT/PhD T32 Steering Committee
- Participant in Kellogg School of Management Executive Education 2013 Program *Management Skills for Innovative University Leaders*.

External Service

- Associate Editor for *Robotica* (2007-2011)
- Conference Organization
 - Local Arrangements Chair for the 2014 *IEEE International Conference on Intelligent Robots and Systems (IROS)*
 - Publication Chair for the 2010 *IEEE International Conference on Automation Science and Engineering (CASE)*
 - Co-Organizer (with Greg Chirikjian, Howie Choset, and Marco Morales) of 2008 *Workshop on the Algorithmic Foundations of Robotics (WAFR)*
- Workshop Organization
 - Co-Organizer (with Aleksandra Kalinowska, Deepak Gopinath, Mahdieh Nejati, Katarina Popovic, and Brenna Argall) of 2020 RSS workshop: *AI and Its Alternatives in Assistive and Collaborative Robotics*

- Co-Organizer (with Aleksandra Kalinowska, Alexander Broad, Brenna Argall, and Adam Zoss) of 2019 RSS workshop: *AI and Its Alternatives for Shared Autonomy in Assistive and Collaborative Robotics*.
- Member of advisory committee for 2017 *Midwest Workshop on Controls and Game Theory*
- Co-Organizer (with Ken Goldberg, Vijay Kumar, and Frank van der Stappen) of 2009 RSS *Workshop on Algorithmic Automation*
- Co-Chair (with Ken Goldberg, Jean-Paul Laumond, and Vijay Kumar) of CASE 2008 workshop: *Workshop on Algorithmic Automation*
- Co-Organizer (with Vijay Kumar) of ICRA 2008 workshop: *Contact Models for Manipulation and Locomotion*
- Co-Organizer (with Francisco Valero-Cuevas and Yoky Matsuoka) of ICRA 2008 workshop: *Is human-like dextrous manipulation within our robotic grasp?*
- Participant in the National Science Foundation and Computing Community Consortium (CCC) *Workshop on Robotics in Manufacturing and Automation*
- Conference Program committees
 - 2022 *Workshop on the Algorithmic Foundations of Robotics*
 - 2022 *Int. Symposium on Robotics Research*
 - 2020 *Int. Conference for Biomedical Robotics and Biomechanics*: Editor
 - 2020 *Workshop on the Algorithmic Foundations of Robotics*
 - 2020 *Robotics: Science and Systems*
 - 2017 *Robotics: Science and Systems*: Area Chair
 - 2016 *Robotics: Science and Systems*: Area Chair
 - 2016 *Workshop on the Algorithmic Foundations of Robotics*
 - 2015 *IFAC Conference on Analysis and Design of Hybrid Systems*
 - 2012 *Workshop on the Algorithmic Foundations of Robotics*
 - 2009 *Robotics: Science and Systems*
 - 2008 *Hybrid Systems: Computation and Control*
 - 2008 *Robotics: Science and Systems*
 - 2008 *IEEE International Conference on Robotics and Automation*
 - 2008 *IEEE Conference on Automation Science and Engineering*
 - 2007 *IEEE/RSJ International Conference on Intelligent Robots and Systems*
 - 2007 *International Conference on Advanced Robotics*
 - 2007 *International Conference on Networked Robots*
 - 2007 *IEEE International Conference on Robotics and Automation*
 - 2006 *IEEE/RSJ International Conference on Intelligent Robots and Systems*
 - 2006 *IEEE International Conference on Robotics and Automation*
 - 2005 *Robotics: Science and Systems*
 - 2005 *IEEE/RSJ International Conference on Intelligent Robots and Systems*
 - 2001 *IEEE/RSJ International Conference on Intelligent Robots and Systems*
- Other Conference Committees (primarily IEEE conference committees for best paper awards over the years)
- National Science Foundation Panelist for programs ranging from control, education, robotics, cyberphysical systems, and others 2006-2017
- Member, IEEE, ASME, and AAAS

STUDENTS AND POSTDOCS ADVISED

- Postdocs

- Dr. Gerardo de la Torre, now at Northrop Grumman
- Dr. Kathrin Flaßkamp, was a Postdoctoral Researcher at the University of Bremen, now a professor at Saarbrücken University
- Dr. David Pekarek, now a senior scientist at Data Tactics
- Dr. Benjamin Tovar, now a Research Software Engineer at Notre Dame
- Ph.D. Students
 - Brian Shucker (CS at University of Colorado), 2006 Ph.D. thesis: *Control of Distributed Robotic Macrosensors*, was at MIT Lincoln Laboratories, now at TALOS robotics.
 - Matt Travers, 2011 Ph.D. thesis: *Impulse Smoothing for Data Association*, now a Systems Scientist at Carnegie Mellon University.
 - Elliot Johnson, 2012 Ph.D. thesis: *Trajectory Optimization and Regulation for Constrained Discrete Mechanical Systems*, now at the Southwestern Research Institute.
 - Elizabeth Jochum (Performance Studies at the University of Colorado), 2013 Ph.D. thesis: *Deux Ex Machina: Towards an Aesthetics of Autonomous and Semi-Autonomous Machines*, now an Associate Professor at Aalborg University.
 - Tim Caldwell, 2013 Ph.D. thesis: *Iterative Methods in Switched System Optimal Control*, postdoc at the University of Colorado at Boulder 2013-2015, Zoox 2015-present.
 - Vlad Seghete, 2014 Ph.D. thesis: *Numerical Methods for Simulation and Control of Impacting Mechanical Systems*. IDEO after DataScope Analytics 2014-present.
 - Jarvis Schultz, 2014 Ph.D. thesis: *Discrete Mechanics Computation for Real-Time Embedded Control*, Northwestern University 2014-2019, AZEVTEC 2019-present.
 - Andrew Wilson 2015 Ph.D. thesis: *Information-based Trajectory Optimization for Active Estimation in Mechanical Systems*, Intuitive Surgical 2015-present.
 - Alex Ansari, 2015 Ph.D. thesis: *Sequential Action Control: Closed-Form Optimal Feedback for Nonlinear and Hybrid Systems*. Postdoc at Carnegie Mellon University 2015-2017, Uber ATG 2017-2021, Cruise 2021-present.
 - Lauren Miller, 2015 Ph.D. thesis: *Optimal Ergodic Control for Active Search and Information Acquisition*. Recipient of Martin Outstanding Doctoral Fellowship. Postdoc at UC Berkeley 2015-2016. Now at Boston Dynamics, after Marble, after HERE.
 - Anastasia Mavrommati, 2017 Ph.D. thesis: *Real-Time Algorithms for Symbol-Based Automation*. Schlumberger-Doll Research 2017-2020; Mathworks 2020-present.
 - Emmanouil Tzorakoleftherakis, 2017 Ph.D. thesis: *Stable Control Synthesis for Human-in-the-Loop Systems*. Mathworks 2017-present.
 - Ian Abraham, 2020 Ph.D. thesis: *Optimal Experimental Learning and Infinite Linear Embeddings*. Belytschko Outstanding Research Award in Mechanical Engineering, Northwestern University (2021); Postdoctoral fellow at Carnegie Mellon University (2020-2021); Assistant Professor of Mechanical Engineering at Yale University (2022-present).

- Ahalya Prabhakar, 2020 Ph.D. thesis: *Communicating and Modeling Information through Motion*. Postdoctoral fellow at EPFL, Switzerland, 2020-present.
- Kathleen Fitzsimons, 2020 Ph.D. thesis: *Motion as an Information Signal in Physical Human-Robot Interaction*. Assistant Professor, Pennsylvania State University 2020-present.
- Rebecca Abbott (ME/Physical Therapy at Northwestern University, co-advised with Prof. James Elliot.) 2021 Ph.D. thesis: *Active Model-Based Inference for Muscle Strength Diagnostics*.
- Giorgos Mamakoukas, 2021 Ph.D. thesis: *Real-Time Safe Control for Model-Based and Data-Driven Robotics*. Motional 2021-present.
- Ana Pervan, 2021 Ph.D. thesis: *Co-Design of Bodies and Strategies*. Wayve 2021-present.
- Taosha Fan, 2022 Ph.D. thesis: *Efficient and Guaranteed Geometric Methods for Motion Generation and Perception*. Meta (Facebook) Artificial Intelligence Research 2022-present.
- Aleksandra (Ola) Kalinowska, 2023 Ph.D. thesis: *Human-Machine Communication in Assistive and Rehabilitation Robotics*. 2022 Recipient of Terminal Year Fellowship.
- Kyra Rudy, 2023 Ph.D. thesis: *Assessment and Assistance for Dynamic and Safety-Critical Human Motion*.
- Thomas Berrueta. 2022 Recipient of the Northwestern Presidential Fellowship—the most prestigious fellowship awarded to current students by Northwestern University.
- Millicent Schlafly
- Annalisa Taylor
- Allison Pinosky
- Muchen Sun (recipient of ME department Martin Fellowship)
- Jake Ketchum
- Joel Meyer
- Jonathan Bosnich
- Ayush Gaggar
- James Avtges
- Zixin Zhang
- Undergraduate and MS Students
 - Kirk Nichols (ECE at University of Colorado)
 - Corrina Gibson (Aerospace at University of Colorado)
 - Matanya Horowitz (ECE at University of Colorado)
 - Yoke Peng Leong
 - Katy Powers
 - Henry Hung

- Camaria Lehman (BME at Northwestern University)
- Elliot Hevel
- Scott Beck
- Vismaya Walawalker
- Samuel Donis
- Alex Samland
- Christopher Kim
- Andrew Kim
- Won Hee Jenny Kim
- Karalyn Baird
- Muchen Sun
- Wu Di
- Maurice Rahme (MSR at Northwestern University)
- Joshua Cohen (MSR at Northwestern University)
- Bowen Feng (MSR at Northwestern University)
- Tianyu Li (MSR at Northwestern University)
- Katarina Popovic (MS in ME at Northwestern University)
- Katie Hughes (MSR at Northwestern University)
- Megan Sindelar (MSR at Northwestern University)
- Sophia Schiffer
- Tara Saxena
- Olivia Li
- Sarah Yung
- Maia Traub
- Maxwell Patwardhan (MS in ME at Northwestern University)
- Visiting Students
 - Amy LaViers (Georgia Institute of Technology, USA)
 - Rowland O'Flaherty (Georgia Institute of Technology, USA)
 - Kathrin Flasskamp (Univ. of Paderborn, Germany)
 - Peter Kingston (Georgia Institute of Technology, USA)

EXTERNAL ACTIVITIES

- Consultant for HDT for SOCOM TALOS exoskeleton project (2016-2017)
- Member of Nousot Scientific Advisory Board (2017-2021)