

Lauren Miller

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Research Interests

Robotics, control of mobile sensors, information-based search, optimal control, active learning, modeling, and estimation

Current Position

Oct. 2015-	Postdoctoral Researcher <i>University of California, Berkeley: Laboratory for Automation Science and Engineering</i> - Developing optimal control and reinforcement learning methods for surgical subtask automation	Berkeley, CA
Oct. 2015-	Research and Development Manager, People and Robots Initiative <i>Center for Information Technology Research in the Interest of Society (CITRIS)</i> - Developing and managing research collaborations, workshops, and events between four campuses and over 80 faculty, initiating new programs, proposals, and partnerships with industry.	Berkeley, CA

Education

2015	Ph.D. in Mechanical Engineering <i>Northwestern University</i> Dissertation: Optimal Ergodic Control for Active Search and Information Acquisition	Evanston, IL
2013	M.S. in Mechanical Engineering <i>Northwestern University</i> Thesis: Simultaneous Optimal Parameter and Mode Transition Time Estimation Applied to Vehicle Traction Modeling	Evanston, IL
2013	Certificate in Management for Scientists and Engineers <i>Kellogg School of Management, Northwestern University</i>	Evanston, IL
2009	A.B./B.E. in Engineering Sciences <i>Dartmouth College</i>	Hanover, NH

Research and Related Professional Experience

2010- 2015	Northwestern University <i>Graduate Researcher: Neuroscience and Robotics (NxR) Laboratory</i> - Motion Planning for Information Acquisition: Developed a closed-loop algorithm for control of mobile sensors, implemented using a bio-inspired robot. - Ergodic Optimal Control: Formulated a motion planning strategy for robotic search using ergodic theory, information theory, and optimal control. - Optimal Estimation Techniques for Hybrid Systems: Developed an algorithm for identifying mode transition times and parameter values in traction models for autonomous vehicles.	Evanston, IL
Fall 2014	Space Exploration Technologies (SpaceX) <i>Intern: Guidance, Navigation and Control Group</i> - Worked on a variety of projects, including analyzing and dispersing aerodynamic data for flight simulation and control design using Matlab and Python.	Hawthorne, CA
Summer 2014	NASA Jet Propulsion Laboratory <i>Intern: Robotic Mobility Group</i> - Investigated and prototyped motion planning algorithms for a class of hopping rovers designed to operate in microgravity environments.	La Cañada Flintridge, CA

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Research and Related Professional Experience (continued)

Fall	Helmut Schmidt University	Hamburg, Germany
2009	<i>Research assistant: Institute for Automation Technology</i> - Developed a C# program and Modelica user interface to dynamically generate simulation models from engineering planning data.	
2009	Hypertherm, Inc. <i>Industry-sponsored project</i> - Conducted failure analysis and testing for lead sets on robotic plasma cutting systems. Designed, built, and evaluated a mechanical prototype to eliminate failure modes.	Hanover, NH
2008	Dartmouth College <i>Research assistant: Signal Processing and Controls Laboratory</i> - Designed an experimental fixture for magnetic eddy current sensor placement for nondestructive testing. Performed system sensitivity and robustness analysis.	Hanover, NH

Leadership and Service

2016	Organizing Committee Co-Chair , Workshop on the Algorithmic Foundations of Robotics (WAFR)
2016	Young Professionals Representative , IEEE Robotics and Automation Society
2015	Organizer , Berkeley Workshop on Algorithms for Human Robot Interaction
2014-2015	Chair , IEEE Robotics and Automation Society Student Activities Committee
2014-2015	Administrative Committee Student Member , IEEE Robotics and Automation Society
2015	Local Arrangements Chair , Bay Area Robotics Symposium
2015	Organizer & Panelist , "Becoming a Robot Guru: Integrating Science, Engineering and Creativity" Workshop, at ICRA 2015 in Seattle, WA.
2013	President , Mechanical Engineering Graduate Student Society
2012-2013	Mentor , Northwestern University Society of Women Engineers
2011-2013	Coach , Mather High School Robotics Club
	Professional Member: IEEE Robotics and Automation Society (RAS), IEEE Control Systems Society (CSS), Society of Women Engineers (SWE)
	Referee: IEEE Trans. on Robotics, IEEE Trans. on Control Systems Technology, IEEE Trans. on Industrial Electronics, Journal of Field Robotics, ACC, ICRA, IROS

Fellowships, Honors, and Awards

2014	Martin Outstanding Doctoral Fellowship (M.E. Department, Northwestern University)
2012-2014	NIH T32 Trainee Fellowship, Pathophysiology and Rehabilitation of Neural Dysfunction
2012	Graduate Student Leadership and Service Award (M.E. Department, Northwestern University)
2012	National Science Foundation Travel Scholarship
2010	Walter P. Murphy Fellowship (M.E. Department, Northwestern University)
2006	Phillip R. Jackson Engineering Sciences Prize (Thayer School of Engineering, Dartmouth College)
2005	Intel Science Talent Search Semifinalist

Teaching Experience

2013	Northwestern University: <i>Teaching Assistant: Everything is the Same: Modeled Systems (Coursera MOOC)</i>
2007-2008	Dartmouth College: <i>Teaching Assistant: Digital Electronics, Thermodynamics</i>

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Journal Articles

- [1] L. M. Miller, Y. Silverman, M. M. Maclver, and T. D. Murphey, "Ergodic exploration of distributed information," *IEEE Transactions on Robotics*, vol. 32, no. 1, pp. 36 – 52, 2016
- [2] L.M. Miller and T.D. Murphey, "Simultaneous optimal estimation of mode transition times and parameters applied to simple traction models," *IEEE Transactions on Robotics*, vol. 29, no. 6, pp. 1496–1503, Dec. 2013

Peer Reviewed Conference Proceedings

- [3] B. Thananjeyan, A. Garg, S. Krishnan, C. Chen, L. Miller, and K. Goldberg, "Multilateral surgical pattern cutting in 2d orthotropic gauzewith deep reinforcement learning policies for tensioning," in *IEEE Int. Conf. on Robotics and Automation*, 2017, submitted
- [4] S. Krishnan, A. Garg, R. Liaw, L. Miller, F. T. Pokorny, and K. Goldberg, "SWIRL: A sequential windowed inverse reinforcement learning algorithm for robot tasks with delayed rewards," in *Workshop on the Algorithmic Foundations of Robotics*, 2016, [PDF](#)
- [5] D. V. Gealy, S. McKinley, M. Guo, L. Miller, S. Vougioukas, J. Viers, S. Carpin, and K. Goldberg, "Co-robotic device for automated tuning of emitters to enable precision irrigation," in *IEEE Int. Conf. on Automation Science and Engineering*, 2016, [PDF](#)
- [6] A. Garg, S. Sen, R. Kapadia, Y. Jen, S. McKinley, L. Miller, and K. Goldberg, "Tumor localization using automated palpation with Gaussian process adaptive sampling," in *IEEE Int. Conf. on Automation Science and Engineering*, 2016 [PDF](#)
- [7] L. M. Miller and T. D. Murphey, "Optimal planning for target localization and coverage using range sensing," in *IEEE Int. Conf. on Automation Science and Engineering (CASE)*, 2015.
- [8] I. D. Neveln, L. M. Miller, M. A. Maclver, and T. D. Murphey, "Improving object tracking through distributed exploration of an information map," in *IEEE Int. Conf. on Intelligent Robots and Systems (IROS)*, 2014, pp. 3441 – 3447
- [9] Y. Silverman, L. M. Miller, M. A. Maclver, and T. D. Murphey, "Optimal planning for information acquisition," in *IEEE Int. Conf. on Intelligent Robots and Systems (IROS)*, Nov. 2013, pp. 5974– 5980
- [10] L.M. Miller and T.D. Murphey, "Trajectory optimization for continuous ergodic exploration on the motion group SE(2)," in *IEEE Int. Conf. on Decision and Control (CDC)*, 2013, pp. 4517 – 4522
- [11] L.M. Miller and T.D. Murphey, "Trajectory optimization for continuous ergodic exploration," in *American Controls Conf. (ACC)*, 2013, pp. 4196–4201
- [12] L.M. Miller and T.D. Murphey, "Optimal contact decisions for ergodic exploration," in *IEEE Int. Conf. on Decision and Control (CDC)*, 2012, pp. 5091–5097
- [13] L.M. Miller and T.D. Murphey, "Simultaneous optimal parameter and mode transition time estimation," in *IEEE Int. Conf. on Intelligent Robots and Systems (IROS)*, 2012, pp. 719–724
- [14] G. Trajcevski, B. Avci, F. Zhou, R. Tamassia, P. Scheuermann, L. Miller, and A. Barber, "Motion trends detection in wireless sensor networks," in *IEEE Int. Conf. on Mobile Data Management (MDM)*, 2012, pp. 232–237