

# Eric R. Eaton

University of Pennsylvania  
Department of Computer and Information Science  
General Robotics, Automation, Sensing & Perception (GRASP) Lab  
3330 Walnut Street; Philadelphia, PA 19104-6309

Office Phone: +1 (215) 746-1734  
E-mail: [eeaton@cis.upenn.edu](mailto:eeaton@cis.upenn.edu)  
Website: <http://seas.upenn.edu/~eeaton/>

*Web Version, Updated February 5, 2018*

## RESEARCH INTERESTS

My primary research interests are in statistical machine learning and artificial intelligence, focusing on lifelong learning, knowledge transfer, multi-task learning, deep learning, representation discovery, interpretable methods, and interactive AI. I am especially interested in large-scale, continual learning systems that are deployed over extended time frames. My research applies these techniques to problems in service robotics and precision medicine.

## EDUCATION

- May 2009 **Ph.D. in computer science**, University of Maryland, Baltimore County  
Thesis: *Selective Knowledge Transfer for Machine Learning*  
Advisor: Marie desJardins. Committee: Tim Finin, Terran Lane, Tim Oates, and Yun Peng.
- Dec. 2005 **M.S. in computer science**, University of Maryland, Baltimore County  
Thesis: *Clustering with Propagated Constraints*  
Advisor: Marie desJardins. Committee: Tim Finin and Tim Oates.
- May 2003 **B.S. *summa cum laude* in computer science**, University of Maryland, Baltimore County  
Certificate of General Honors. Minor: psychology.

## PROFESSIONAL APPOINTMENTS

### University of Pennsylvania

- 2017 – present *Senior Lecturer*, Computer and Information Science Dept., GRASP Lab  
2013 – 2017 *Lecturer*, Computer and Information Science Dept., GRASP Lab

### Bryn Mawr College

- 2013 – 2016 *Research Associate*, Computer Science Department  
2010 – 2013 *Visiting Assistant Professor*, Computer Science Department

### Lockheed Martin Advanced Technology Labs, Cherry Hill, NJ

- 2008 – 2010 *Senior Research Scientist*, Artificial Intelligence Group

### Swarthmore College

- 2009 – 2010 *Visiting Assistant Professor (Part-time)*, Computer Science Department

### University of Maryland, Baltimore County

- 2003 – 2008 *Research Assistant* with Dr. Marie desJardins, Computer Science and Electrical Engr. Dept.  
2005 – 2008 *Instructor (Part-time)*, Computer Science and Electrical Engineering Department

## FUNDING

### Major Federal Grants and Contracts [Total Federal Funding as Primary or Co-Investigator: **\$9,213,914**]

- [G1] Eric Eaton (PI), Satinder Singh Baveja (Co-I), Michael Littman (Co-I), Fei Sha (Co-I), and Peter Stone (Co-I). *Lifelong Learning of Perception and Action in Autonomous Systems*. DARPA. Revised proposed amount: **\$5,365,307** total (my group's portion: \$1,936,308). Duration: January 2018 – December 2021. [Selected for award; currently in negotiation]
- [G2] Eric Eaton (Co-I). *Causal Hypotheses from Analysis of Obscure Systems*. DARPA. Subcontract from Two Six Labs. My group's portion: **\$522,216**. Duration: November 2017 – June 2021.
- [G3] Eric Eaton (Co-I). *Multi-source Activity Graph Latent Uncovering & Merging*. DARPA. Subcontract from Lockheed Martin. My group's portion: **\$1,002,000**. Duration: September 2017 – August 2021.

- [G4] Eric Eaton (PI). *Deep Lifelong Reinforcement Learning for Resilient Control and Coordination*. Air Force Research Lab, Grant #FA8750-16-1-0109. **\$493,405** total. Duration: Sept. 2016 – Sept. 2018.
- [G5] Matthew Taylor (PI), Eric Eaton (Co-I), and Paul Ruvolo (Co-I). *Lifelong Transfer Learning for Heterogeneous Teams of Agents in Sequential Decision Processes*. Air Force Research Lab, Grant #FA8750-14-1-0069. **\$606,361** total (my group's portion: \$310,918). Subcontract from Washington State University. Duration: March 2014 – Feb. 2016.
- [G6] Eric Eaton (PI) and Paul Ruvolo (Co-I). *Interactive Transfer for Continuous Lifelong Learning*. Office of Naval Research, Grant #N00014-11-1-0139. **\$349,534** total (my group's portion: \$310,800). Duration: Oct. 2013 – Sept. 2015.
- [G7] Eric Eaton (PI) and Terran Lane (Co-I). *Interactive Transfer for Continuous Lifelong Learning*. Office of Naval Research, Grant #N00014-11-1-0139. **\$575,091** total (my group's portion: \$365,337). Duration: Jan. 2011 – Sept. 2013.
- [G8] Eric Eaton (PI). *Analysis of Complex Data Using Heterogeneous Relational Models*. Office of Naval Research, Contract #N00014-10-C-0192. **\$300,000** total (my group's portion: \$185,857). Subcontract from Lockheed Martin. Duration: Apr. 2010 – Mar. 2013.

### Other Research Grants

- [GO1] Eric Eaton (PI). *Temporal Modeling and Prediction using Multi-Task Deep Learning* – Student project funding. Jacobs Levy Equity Management Center for Quantitative Financial Research. **\$5,000**. Duration: Sept. 2014 – June 2015.

### Non-Research Grants

[Event funding; no funds were allocated for my research]

- [GN1] Eric Eaton (PI). *The Seventh Symposium on Educational Advances in Artificial Intelligence (EAAI 2017)*. National Science Foundation, Grant #1650295. **\$22,600** total. Duration: Sept. 2016 – Aug. 2018.
- [GN2] Eric Eaton (PI). *Doctoral Mentoring Consortium at the 25th International Joint Conference on Artificial Intelligence (IJCAI 2016)*. National Science Foundation, Grant #1631562. **\$15,000** total. Duration: April 2016 – March 2017.

## PUBLICATIONS

[Names in *italics* are students or postdocs whose work I supervised.]

### Edited Volumes

- [V1] Matteo Leonetti, chair; Eric Eaton and Pooyan Fazli, co-chairs. (2014). *Knowledge, Skill, and Behavior Transfer in Autonomous Robots: Proceedings of the 2014 AAAI Fall Symposium*. AAAI Technical Report FS-14-04, ISBN 978-1-57735-694-3, AAAI Press.
- [V2] Eric Eaton, Carla Gomes, and Brian Williams, editors. (2014). *Special issue of AI Magazine on Computational Sustainability*. Volume 35, numbers 2–3 (Summer 2014 and Fall 2014), AAAI Press.
- [V3] Eric Eaton, chair. (2013). *Lifelong Machine Learning: Proceedings of the 2013 AAAI Spring Symposium*. AAAI Technical Report SS-13-05, ISBN 978-1-57735-602-8, AAAI Press.

### Journal Articles

- [J1] Decebal Constantin Mocanu, Haitham Bou Ammar, Luis Puig, Eric Eaton, Antonio Liotta. (2017). “Estimating 3D trajectories from 2D projections via disjunctive factored four-way conditional restricted Boltzmann machines.” *Pattern Recognition* 69: 325–335, September. DOI 10.1016/j.patcog.2017.04.01.
- [J2] Eric Eaton. (2017). “Teaching integrated AI through interdisciplinary project-driven courses.” *AI Magazine* 38(2): 13–21.
- [J3] Gilmer Valdes, José Marcio Luna, Eric Eaton, Charles B. Simone II, Lyle H. Ungar, and Timothy D. Solberg. (2016). “MediBoost: a patient stratification tool for interpretable decision making in the era of precision medicine.” *Scientific Reports* 6:37854. DOI 10.1038/srep37854.
- [J4] Eric Eaton, Carla Gomes, and Brian Williams. (2014). “Computational sustainability.” *AI Magazine* 35(2): 3–7.
- [J5] Eric Eaton, Marie desJardins, and Sara Jacob. (2014) “Multi-view constrained clustering with an incomplete mapping between views.” *Knowledge and Information Systems* 38(1): 231–257. DOI 10.1007/s10115-012-0577-7. Published online November 21, 2012.

- [J6] Kiri Wagstaff, Marie desJardins, and Eric Eaton. (2010). “Modeling and learning user preferences over sets.” *Journal of Experimental & Theoretical Artificial Intelligence* 22(3): 237–268.

### Highly Refereed Conference Papers

- [C1] *Mohammad Rostami*, Soheil Kolouri, Kyungnam Kim, and Eric Eaton. (2018). “Multi-agent distributed lifelong learning for collective knowledge acquisition.” In *Proceedings of the Conference on Autonomous Agents and Multi-Agent Systems*. (AAMAS-18). [full paper]
- [C2] *Christopher Clinger* and Eric Eaton. (2017). “Lifelong machine learning with Gaussian processes.” In *Proceedings of the European Conference on Machine Learning & Principles and Practice of Knowledge Discovery in Databases (ECML-PKDD-17)*. [acceptance rate: 27%]
- [C3] *David Isele*, *José Marcio Luna*, Eric Eaton, Gabriel V. de la Cruz, James Irwin, Brandon Kallaher, and Matthew E. Taylor. (2016). “Lifelong learning for disturbance rejection on mobile robots.” In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2016)*.
- [C4] *David Isele*, *Mohammad Rostami*, and Eric Eaton. (2016). “Using task features for zero-shot knowledge transfer in lifelong learning.” In *Proceedings of the 2016 International Joint Conference on Artificial Intelligence (IJCAI-16)*. [oral presentation; acceptance rate: 25.0%. **Awarded sole “IJCAI-16 Distinguished Student Paper”**.]
- [C5] *Haitham Bou Ammar*, Rasul Tutunov, and Eric Eaton. (2015). “Safe policy search for lifelong reinforcement learning with sub-linear regret”. In *Proceedings of the 2015 International Conference on Machine Learning (ICML-15)*. [oral presentation; acceptance rate: 26.0%]
- [C6] *Haitham Bou Ammar*, Eric Eaton, *José Marcio Luna*, and Paul Ruvolo. (2015). “Autonomous cross-domain knowledge transfer in lifelong policy gradient reinforcement learning”. In *Proceedings of the 2015 International Joint Conference on Artificial Intelligence (IJCAI-15)*. [long oral presentation; acceptance rate: 28.8%. **Nominated for Distinguished Paper award**.]
- [C7] *Haitham Bou Ammar*, Eric Eaton, Matthew Taylor, and Paul Ruvolo. (2015). “Unsupervised cross-domain transfer in policy gradient reinforcement learning via manifold alignment.” In *Proceedings of the 29th AAAI Conference on Artificial Intelligence (AAAI-15)*, Jan. 25–29, Austin, TX, AAAI Press. [acceptance rate: 26.67%]
- [C8] *Paul Ruvolo* and Eric Eaton. (2014). “Online multi-task learning using sparse dictionary optimization.” In *Proceedings of the 28th AAAI Conference on Artificial Intelligence (AAAI-14)*, July 27–31, Québec City, Canada, AAAI Press. [oral presentation; acceptance rate: 28%]
- [C9] *Haitham Bou Ammar*, Eric Eaton, Paul Ruvolo, and Matthew Taylor. (2014). “Online multi-task learning for policy gradient methods.” In *Proceedings of the 2014 International Conference on Machine Learning (ICML-14)*, JMLR W&CP 32 (1) : 1206–1214, June 21–26, Beijing, China. [oral presentation; acceptance rate for cycle II: 22.3%, overall acceptance rate: 25%]
- [C10] *Paul Ruvolo* and Eric Eaton. (2013). “Active task selection for lifelong machine learning.” In *Proceedings of the 27th AAAI Conference on Artificial Intelligence (AAAI-13)*, pp. 862–868, July 14–18, Bellevue, WA, AAAI Press. [oral presentation; acceptance rate: 29%]
- [C11] *Paul Ruvolo* and Eric Eaton. (2013). “ELLA: an efficient lifelong learning algorithm.” In *Proceedings of the 2013 International Conference on Machine Learning (ICML-13)*, Journal of Machine Learning Research - Proceedings Track 28(1): 507–515, June 16–21, Atlanta, GA. [acceptance rate for cycle I: 17.5%, overall acceptance rate: 26%]
- [C12] Eric Eaton and *Rachael Mansbach*. (2012) “A spin-glass model for semi-supervised community detection.” In *Proceedings of the 26th AAAI Conference on Artificial Intelligence (AAAI-12)*, pp. 900–906, Toronto, Canada, AAAI Press. [acceptance rate: 26%]
- [C13] Douglas Fisher, Bistra Dilkina, Eric Eaton, and Carla Gomes. (2012) “Incorporating computational sustainability into AI education through a freely-available, collectively-composed supplementary lab text.” In the 3rd International Conference on Computational Sustainability (CompSust-12), July 5–6, Copenhagen, Denmark. [oral presentation]
- [C14] Eric Eaton and Marie desJardins. (2011). “Selective transfer between learning tasks using task-based boosting.” In *Proceedings of the 25th AAAI Conference on Artificial Intelligence (AAAI-11)*, pp. 337–342, August 7–11, San Francisco, CA, AAAI Press. [oral presentation; acceptance rate: 24.8%]
- [C15] Eric Eaton, Marie desJardins, and Sara Jacob. (2010). “Multi-view clustering with constraint propagation

- for learning with an incomplete mapping between views.” In *Proceedings of the 2010 Conference on Information and Knowledge Management (CIKM-10)*, pp. 389–398, October 26–30, Toronto, Canada, ACM Press. [oral presentation; acceptance rate: 13.4%]
- [C16] Eric Eaton, Gary Holness, and Daniel McFarlane. (2010). “Interactive learning using manifold geometry.” In *Proceedings of the 24th AAAI Conference on Artificial Intelligence (AAAI-10)*, pp. 437–443, July 11–15, Atlanta, GA, AAAI Press. [oral presentation; acceptance rate: 26.9%]
- [C17] Eric Eaton, Marie desJardins, and Terran Lane. (2008). “Modeling transfer relationships between learning tasks for improved inductive transfer.” In *Proc. of the 2008 European Conference on Machine Learning (ECML-08)*, pp. 317–332, September 15–19, Antwerp, Belgium, Springer-Verlag. [oral presentation; acceptance rate: 20%]
- [C18] Marie desJardins, Eric Eaton, and Kiri Wagstaff. (2006). “Learning user preferences for sets of objects.” In *Proceedings of the 23rd International Conference on Machine Learning (ICML-06)*, June 25–29, Pittsburgh, PA, ACM Press. [oral presentation; acceptance rate: 20%; awarded recognition as a NASA Tech Brief in 2008.]

### Editorials

- [E1] Eric Eaton, Tom Dietterich, Maria Gini, Barbara J. Grosz, Charles L. Isbell, Subbarao Kambhampati, Michael Littman, Francesca Rossi, Stuart Russell, Peter Stone, Toby Walsh, and Michael Wooldridge. (2015). “Who speaks for AI?” *AI Matters* 2(2): 4–14. <http://doi.acm.org/10.1145/2847557.2847559>.

### Preprints

- [U1] *Decebal Constantin Mocanu*, Maria Torres Vega, Eric Eaton, Peter Stone, Antonio Liotta. (2016). “Online contrastive divergence with generative replay: experience replay without storing data.” <https://arxiv.org/abs/1610.05555>.
- [U2] Rasul Tutunov, *Haitham Bou Ammar*, Ali Jadbabaie, and Eric Eaton. (2014). “On the degree distribution of Pólya urn graph processes.” <http://arxiv.org/abs/1410.8515>.

### Refereed Workshops, Symposia, and Less-Selective Conferences

- [W1] *David Isele*, Eric Eaton, Mark Roberts, and David Aha. (2018). “Modeling consecutive task learning with task graph agendas”. In *Proceedings of the Conference on Autonomous Agents and Multi-Agent Systems (AAMAS-18)*. [extended abstract]
- [W2] Eric Eaton, *Caio Mucchiani*, *Mayumi Mohan*, *David Isele*, *Jose Marcio Luna*, and *Christopher Clingerman*. (2016). “Design of a low-cost platform for autonomous mobile service robots.” In the IJCAI-16 Workshop on Autonomous Mobile Service Robots, July.
- [W3] *David Isele*, *José Marcio Luna*, Eric Eaton, Gabriel V. de la Cruz, James Irwin, Brandon Kallaher, and Matthew E. Taylor. (2016). “Work in progress: Lifelong learning for disturbance rejection on mobile robots.” In the *AAMAS-16 Adaptive Learning Agents workshop*, May.
- [W4] Eric Eaton, *Haitham Bou Ammar*, Paul Ruvolo, *José Marcio Luna*, and Matthew E. Taylor. (2015). “Lifelong machine learning for robotic control and coordination.” [Poster Presentation] In the Northeast Robotics Colloquium, November.
- [W5] *Haitham Bou Ammar*, Eric Eaton, Matthew E. Taylor, *Decebal Mocanu*, Kurt Driessens, Gerhard Weiss, Karl Tuyls. (2014). “An automated measure of MDP similarity for transfer in reinforcement learning.” In *Proceedings of the AAAI 2014 Workshop on Machine Learning for Interactive Systems: Bridging the Gap between Perception, Action and Communication*, July 27–28.
- [W6] *Vishnu Purushothaman Sreenivasan*, *Haitham Bou Ammar*, and Eric Eaton. (2014) “Online multi-task gradient temporal-difference learning.” [Student Abstract]. In *Proceedings of the 28th AAAI Conference on Artificial Intelligence (AAAI-14)*, July 27–31.
- [W7] *Paul Ruvolo* and Eric Eaton. (2013). “Online multi-task learning based on K-SVD.” In *Proceedings of the ICML 2013 Workshop on Theoretically Grounded Transfer Learning*, Atlanta, GA, June.
- [W8] *Paul Ruvolo* and Eric Eaton. (2013). “Scalable lifelong learning with active task selection.” In *Proceedings of the AAAI 2013 Spring Symposium on Lifelong Machine Learning*, pp. 33–39, Stanford, CA, March 25–27, AAAI Press.
- [W9] Douglas Fisher, Bistra Dilkina, Eric Eaton, and Carla Gomes. (2012) “Incorporating computational sustainability into AI education through a freely-available, collectively-composed supplementary lab text.” In

*Proceedings of the Third AAI Symposium on Educational Advances in Artificial Intelligence (EAAI-12)*, Toronto, Canada, July.

- [W10] Diane Oyen, Eric Eaton, and Terran Lane. (2012) “Inferring tasks for improved network structure discovery.” [Poster Presentation] In the *Snowbird Learning Workshop*, Snowbird, Utah, April 3–6.
- [W11] Eric Eaton and Terran Lane. (2011). “The importance of selective knowledge transfer for lifelong learning.” In *Working Notes of the AAI-11 Workshop on Lifelong Learning from Sensorimotor Experience*.
- [W12] *Samantha Wood*, Michelle Mills Strout, David G. Wonnacott, and Eric Eaton. (2011) “SMOReS: Sparse Matrix Omens of Reordering Success.” [Poster Presentation] In *Proceedings of the 32nd ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI-11)*, June 4–8, San Jose, CA, ACM Press. [Awarded 1st place in the PLDI Student Research Competition, Undergraduate Category.]
- [W13] Eric Eaton and Marie desJardins. (2009). “Set-based boosting for instance-level transfer.” In *Proceedings of the IEEE International Conference on Data Mining Workshop on Transfer Mining*, December 6, Miami, FL, IEEE Press.
- [W14] Eric Eaton, Gary Holness, and Daniel McFarlane. (2009). “Interactive learning using manifold geometry.” In *Proceedings of the AAI Fall Symposium on Manifold Learning and Its Applications*, November 5–7, Arlington, VA. AAI Technical Report FS-09-04, AAI Press.
- [W15] Eric Eaton. (2008). “Gridworld search and rescue: A project framework for a course in artificial intelligence.” In *Proceedings of the AAI-08 AI Education workshop*, pp. 34–39, July 13–14, Chicago, IL, AAI Press.
- [W16] Eric Eaton, Marie desJardins, and Terran Lane. (2008). “Using functions on a model graph for inductive transfer.” In the *Northeast Student Colloquium on Artificial Intelligence (NESCAI-08)*, May 2–4, Ithaca, NY.
- [W17] Eric Eaton, Marie desJardins, and *John Stevenson*. (2007). “Using multiresolution learning for transfer in image classification.” [Student Abstract] In *Proceedings of the 22nd AAI Conference on Artificial Intelligence (AAI-07)*, July 22–26, Vancouver, British Columbia, Canada, AAI Press.
- [W18] Eric Eaton. (2006). “Multi-resolution learning for knowledge transfer.” In *Proceedings of the 21st AAI Conference on Artificial Intelligence (AAI-06)* [Doctoral Consortium], July 16–20, Boston, MA, AAI Press.
- [W19] Eric Eaton and Marie desJardins. (2006). “Knowledge transfer with a multiresolution ensemble of classifiers.” In *Proceedings of the ICML-06 Workshop on Structural Knowledge Transfer for Machine Learning*, June 29, Pittsburgh, PA.
- [W20] Marie desJardins, Eric Eaton, and Kiri Wagstaff. (2005). “A context-sensitive and user-centric approach to developing personal assistants.” In *Proceedings of the AAI Spring Symposium on Persistent Assistants*, March 21–23, Stanford, CA, AAI Press.

### Magazine Reports

- [M1] Vita Markman, Georgi Stojanov, Bipin Indurkha, Takashi Kido, Keiki Takadama, George Konidaris, Eric Eaton, Naohiro Matsumura, Renate Fruchter, Don Sofge, William F. Lawless, Omid Madani, and Rahul Sukthankar. (2013). “Reports of the 2013 AAI Spring Symposium Series.” In *AI Magazine* 34(3): 93–98.

### Technical Reports and Non-Refereed Publications

- [R1] Katherine Guo and Eric Eaton. (2013) “Multi-agent, cooperative, lifelong transfer learning for target classification.” Lockheed Martin ATL Technical Report, 6 pages, October.
- [R2] Karen Heigh, Fusun Yaman, and Eric Eaton. (2012). “Self-improving automatic machine learning.” Raytheon/ BBN Technologies Technical Report #W12006-BBN, 9 pages, January.
- [R3] Martin Hofmann, Honglak Lee, Eric Eaton, Brian Kettler, Katherine Guo, and Sergey Malinchik. (2012). “An automatic interactive machine learning tool.” Lockheed Martin ATL Technical Report #DS-105-421-1798RFI, 10 pages, January.
- [R4] Eric Eaton, Dan McFarlane, and Martin Hofmann. (2009). “Analysis of complex data using heterogeneous relational models.” Lockheed Martin ATL Technical Report #DS-104-421-1610WP, 6 pages, March.
- [R5] Eric Eaton, Gary Holness, and Dan McFarlane. (2009). “Situational awareness through interactive learn-

ing.” Lockheed Martin ATL Technical Report #DS-104-421-1607WP, 4 pages, March.

- [R6] Meghann Lomas, Daniel McFarlane, Eric Eaton, Robert Szczerba, and Jerry Franke. (2009). “Dynamic ensemble planning for tactical hierarchies.” Lockheed Martin ATL Technical Report #DS-104-421-1604WP, 4 pages, March.
- [R7] Eric Eaton, Katherine Guo, and Martin Hofmann. (2009). “Predicting and verifying effects of cyber operations from indirect observations.” Lockheed Martin ATL Technical Report #DS-105-421-1598WP, 5 pages, January.
- [R8] Eric Eaton, Katherine Guo, and Martin Hofmann. (2008). “Multimodal and temporal learning using relational networks.” Lockheed Martin ATL Technical Report #DS-105-421-1583RFI, 7 pages, November.

### Theses

- [T1] Eric Eaton. (2009). *Selective Knowledge Transfer for Machine Learning*. Ph.D. dissertation, University of Maryland, Baltimore County.
- [T2] Eric Eaton. (2005). *Clustering with Propagated Constraints*. Master’s Thesis, University of Maryland, Baltimore County.

### Online Educational Materials

- [O1] Douglas H. Fisher, Eric Eaton, Bistra Dilkina, and Carla Gomes (eds.) *Artificial Intelligence for Computational Sustainability: A Lab Companion*. Available online at [http://en.wikibooks.org/wiki/Artificial\\_Intelligence\\_for\\_Computational\\_Sustainability:\\_A\\_Lab\\_Companion](http://en.wikibooks.org/wiki/Artificial_Intelligence_for_Computational_Sustainability:_A_Lab_Companion). [This is an ongoing experiment in crowd-sourced creation of open educational materials. The wikibook is designed to supplement an existing AI course with sustainability-related exercises, and was featured at EAAI-12 and CompSust-12.]

### Software

- [S1] Alex Baucom and Eric Eaton. (2017). *Robust Indoor Navigation for Low-Cost Service Robots*. [Code and framework for low-cost robots used to facilitate educational courses on service robots. Available at <https://github.com/GRASP-ML/ServiceRobots>.]
- [S2] Eric Eaton. (2008). *Gridworld search and rescue: A project framework for a course in artificial intelligence*. [This educational software allows students to develop an intelligent agent for a Search and Rescue application in a partially observable gridworld. It allows students to focus on high-level AI issues for solving the problem rather than low-level robotic navigation. It was used as the AI semester project at UMBC (CMSC 471, Fall 2007) and Swarthmore College (CPSC 063, Fall 2009), and has since been used at several other universities. The simulation framework is freely available for educational and not-for-profit research purposes at <http://seas.upenn.edu/~eeaton/searchandrescue/>.]
- [S3] Eric Eaton, Marie desJardins, and Kiri Wagstaff. (2006). *DDPref: Learning preferences for sets of objects*. [A Java implementation of the DDPref language for expressing preferences over sets of objects, and an algorithm for learning those preferences from example sets, as described in the ICML-06 paper “Learning user preferences for sets of objects.” The library is available under the GPL at <http://seas.upenn.edu/~eeaton/software/DDPref.zip>.]

### INVITED TALKS

[Excludes conference paper presentations]

- *Efficient Lifelong Machine Learning: a Consecutive Task Learning Perspective*. Presented at TU Darmstadt, August 2017.
- *Efficient Lifelong Machine Learning: a Consecutive Task Learning Perspective*. Presented at the University of Washington, April 2017.
- *Efficient Lifelong Machine Learning: a Consecutive Task Learning Perspective*. Presented at the NIPS-16 Workshop on Continual Learning and Deep Networks, Barcelona, Spain, December 2016.
- *Efficient Lifelong Machine Learning*. Presented at Olin College, November 2015.
- *Efficient Lifelong Machine Learning*. Presented at Worcester Polytechnic Institute, April 2015.
- *Advances in Machine Learning: Toward Big Data and Lifelong Learning*. Presented at the University of Pennsylvania, April 2015.
- *Efficient Lifelong Machine Learning*. Presented at Google DeepMind, March 2015.
- *Efficient Lifelong Machine Learning*. Presented at the College of William & Mary, February 2015.

- *Efficient Lifelong Machine Learning*. Presented at Georgia Tech, February 2015.
- *Efficient Lifelong Machine Learning*. Presented at the Naval Research Lab, AI Seminar Series, January 2015.
- *Efficient Lifelong Machine Learning*. Presented at the University of Pittsburgh, March 2014.
- *Efficient Lifelong Machine Learning*. Presented at Lockheed Martin Advanced Technology Labs, July 2013.
- *Efficient Lifelong Machine Learning*. Presented at Wesleyan University, March 2013.
- *Continual Learning Agents: From transfer learning to lifelong machine learning*. Presented at the Naval Research Lab, Artificial Intelligence Seminar Series (Host: David Aha), March 2012.
- *Continual Learning Agents: From transfer learning to lifelong machine learning*. Presented at the University of Massachusetts, Lowell, February 2012.
- *Continual Learning Agents: From transfer learning to lifelong machine learning*. Presented at Towson University, March 2011.
- *Spectral clustering: Identifying groups in relational networks*. Presented at Bryn Mawr College, July 2010.
- *Interactive learning using manifold geometry*. Presented at Villanova University, April 2010.
- *Improving machine learning through knowledge transfer*. Presented at Rutgers University, CS Colloquium Series (Host: Michael Littman), February 2009.
- *Improving machine learning through knowledge transfer*. Presented at Lockheed Martin ATL, April 2008.

## PANEL MEMBER

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- AAAI-17 Doctoral Consortium Panel on *Launching and Managing Your Career*, San Francisco. Feb. 2017.
- Panel at the NIPS-16 Workshop on Continual Transfer and Deep Networks, Barcelona, Spain. Dec. 2016.
- AAAI-15 Doctoral Consortium Panel on *Launching and Managing Your Career*, Austin, TX. January 2015.
- AAAI-14 Doctoral Consortium Panel on *Launching and Managing Your Career*, Québec, Canada. July 2014.
- Educational Advances in Artificial Intelligence (EAAI-12) Symposium at AAAI-12, panel on *AI and Sustainability*, Toronto, Canada. July 2012.
- Educational Advances in Artificial Intelligence (EAAI) Symposium at AAAI-11, panel on *Teaching challenges in the classroom*, San Francisco, CA. August 2011.

## STUDENT RESEARCH ADVISING

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### Postdoctoral Fellows

The list below includes postdocs who have worked in my research group. In all cases, I served as each postdoc's sole research advisor and they were supported entirely by my grants.

- James Stokes, Ph.D. (2017–present at Penn): deep lifelong learning
- José Marcio Luna Castaneda, Ph.D. (2014–2016 at Penn): lifelong learning for robotics and medicine
  - Continued on to be a research scientist at Penn Medicine
- Haitham Bou Ammar, Ph.D. (2013–2015 at Penn): lifelong reinforcement learning
  - Completed a second postdoc at Princeton; now an assistant prof. at the American Univ. of Beirut.
- Paul Ruvolo, Ph.D. (2012–2013 at Bryn Mawr College): lifelong learning, community detection
  - Now an assistant professor at Olin College.
- Steven Gutstein, Ph.D. (2011–2012 at Bryn Mawr College): lifelong learning
  - Continued on to work at JPMorgan.

### Dissertation Committees

- Pengyuan Shen. (2018). *Development of a Methodology for Fast Optimization of Building Retrofit and Decision Making Support*. Ph.D., Department of Architecture, University of Pennsylvania. (William Braham, advisor)
- Boyu Wang. (2016). *Transfer and Multitask Learning Methods for Improving Brain Signal Analysis*. Ph.D. Dissertation, McGill University. (Joelle Pineau, advisor)
- Diane Oyen. (2013). *Interactive Exploration of Multitask Dependency Networks*. Ph.D. Dissertation, University of New Mexico. (Terran Lane, advisor)

### PhD Students

The list below includes doctoral students who have worked in my research group. Unless otherwise noted, I served as their primary research advisor. *Italics* indicates students that were supported by my grants. Per University rules, the PhD students are assigned a tenured co-advisor.

- *Seungwon Lee*, Penn CIS (July. 2017–present): lifelong learning
  - Co-advisor: Daniel Lee
- *Jorge Mendez*, Penn CIS (April. 2017–present): lifelong learning
  - Co-advisor: Daniel Lee
- *Mohammad Rostami*, Penn ESE (Sept. 2014–present): multi-agent multi-task and lifelong learning
  - Co-advisor: Daniel Lee
- *David Isele*, Penn CIS (Sept. 2014–present): lifelong learning for robotic control and perception
  - Co-advisor: CJ Taylor
- Chris Clingerman, Penn CIS (June 2014–present): nonparametric lifelong learning for robotics
  - Primary advisor: Daniel Lee; I serve as a secondary research advisor

### Visiting PhD Students

The list below includes doctoral students from other institutions who worked in my research group for short time periods. *Italics* indicates students that were supported by my grants.

- *Decebal Mocanu*, PhD student at Technische Universiteit Eindhoven. Visiting Scholar at Penn (Sept.–Dec. 2014): deep learning, robotics
- *David Cooper*, PhD student at UMass. Lockheed Martin ATL Summer Intern (May–Aug. 2009): multivariate motif discovery in time series

### Independent PhD Student Studies

The list below includes doctoral students who completed independent studies in my research group. *Italics* indicates students that were supported by my grants.

- *Caio Mucchiani*, Penn MechE. (Jan.–May. 2016): design of a low-cost service robot and modular arm
  - Primary advisor: Mark Yim

### Non-Thesis Master's Research

This list includes master's students who worked on research projects in my group. This research was performed for salaried or hourly pay, for independent study credit, or on a volunteer basis. For each student, I was the primary research advisor unless otherwise noted.

- Meghna Gummadi (Jan. 2018–present): robust navigation for service robots
- Karl Schmeckpeper (Jan. 2018–present): robust navigation for service robots
- Kuan-Chen Chiu (Jan. 2018–present): lifelong deep reinforcement learning
- Chi Zhang (Jan. 2018–present): deep learning for robot navigation and vision
- Obinna Asinugo (July 2017–present): robotic navigation and deep learning for vision
- Varun Gupta (Jan. 2017–present): cross-paradigm lifelong learning
- Shashank Shivkumar (Nov. 2016–present): lifelong inverse reinforcement learning
- William Bradbury Thompson (Sept. 2016–Aug. 2017): RL for dynamic stabilization
- Jorge Mendez (Sept. 2016–May. 2017): lifelong learning for service robotics
- Alex Baucom (Jan. 2017–May 2017): robust long-term deployment of service robots
- Sakthivel Sivaraman (Jan. 2017–May 2017): robust long-term deployment of service robots
- Rakshita Tandon (Jan. 2016–May 2016): automatic basis dimensionality selection for ELLA
- Ishan Srivastava (Jan. 2016–May 2016): hybrid generative and experience replay for online deep learning
- Yanwei Du (Sept. 2014–April 2015): lifelong learning for quadrotor control
  - Primary advisor: Insup Lee
- Yuncai Cui (Sept.–Dec 2014): multi-task learning for control of modular robots
  - Primary advisor: Mark Yim
- Levi Cai (Sept.–Dec 2014): multi-task learning for control of modular robots
  - Primary advisor: Mark Yim



- Chenyang Zhao (Sept.–Dec 2014): multi-task learning for control of modular robots  
– Primary advisor: Mark Yim
- Neha Kakkar, Penn SE (June–Aug. 2014): object recognition via lifelong learning
- Vishnu P. Sreenivasan, Penn CIS (Sept. 2013–May 2014): online multi-task reinforcement learning
- Tyler Rush, Bryn Mawr R.A. (May–Aug. 2011): Gaussian process models for community detection

#### **Undergraduate Theses and Senior Projects (primary advisor)**

- Sacha Best, Nova Fallen, Scott Freeman, Sebastian Lozano. (2017). Interactive debate with Amazon Echo. Undergraduate Senior Project, University of Pennsylvania.
- Rachel Adducci, Lauren Datz, Harrison Huh, and Anastasiya Kravchuk-Kirilyuk. (2017). Personalized modeling of wellness from FitBit data. Undergraduate Senior Project, University of Pennsylvania.
- Fangyu Panda Xiong. (2015). Topic: combining active querying with task selection in multi-task learning. Undergraduate Thesis, Haverford College.
- Hunter Schlacks. (2015). Topic: lifelong learning. Undergraduate Senior Project, University of Pennsylvania.
- Trisha Kothari, Charu Jangid, Edward Wadsworth, and Jarred Spear. (2014). Multi-task Learning of Customer Valuation Models. Undergraduate Senior Project, University of Pennsylvania.
- Caitlyn Clabaugh. (2013). *PartyBot: Learning to Create Computational Music Mashups*. Undergraduate Thesis, Bryn Mawr College.  
– Continued to PhD studies at the University of Southern California
- Rose Abernathy. (2013). *Social-Network-Based Guided Emergent Narrative*. UG Thesis, Haverford College.
- Meagan Neal. (2013). *Reproducing Kernel Hilbert Spaces in Multi-Task Machine Learning*. Undergraduate Thesis, Bryn Mawr College. (Co-advised by Leslie Cheng, Bryn Mawr Math Dept.)
- Leila Zilles. (2012). *A Framework for Improving Statistical Machine Translation Between Languages with Scarce Bilingual Resources*. Undergraduate Thesis with Honors, Bryn Mawr College.  
– Continued to PhD studies at the University of Washington  
– Awards: NSF Graduate Research Fellowship; BMC Gertrude Slaughter Fellowship
- Emily Levine. (2012). *Learning Models to Detect Early Onset Parkinson Disease*. Undergraduate Thesis with Honors, Bryn Mawr College.
- Benjamin Cutilli. (2012). *Computer Vision and its Application in Self-Driving Cars*. Undergraduate Thesis, Haverford College. (Co-advised by David Wonnacott, Haverford College.)

#### **Undergraduate Research** (in addition to undergraduate theses listed above)

- Zach Hay. (Penn '18). Topic: lifelong reinforcement learning
- Monica Vyavahare. (Penn '19). Topic: learning from demonstration.
- Tamir H. Frank. (Penn '19). Topic: machine learning.
- Woonki Jeon. (Penn '15). Topic: multi-task learning of object recognition.
- Kruesit Upatising. (Penn '15). Topic: multi-task learning of object recognition.
- Lisa Seung-Yeon Lee (Princeton '15; GRASP REU student): online multi-task reinforcement learning
- Fangyu Panda Xiong (Haverford '15): object recognition
- Gabriel Ryan (Swarthmore '13): lifelong learning using the Horde architecture
- Jacy Li (Bryn Mawr '14): online multitask learning
- Yinxuan Rachel Li (Bryn Mawr '14): semi-supervised community detection
- Meagan Neal (Bryn Mawr '13): interactive multi-task learning (also sr. thesis, as described above)
- David Wilikofsky (Swarthmore '12): human-agent transfer for reinforcement learning
- Leila Zilles (Bryn Mawr '12): active transfer learning (also sr. thesis, as described above)
- Kerstin Baer (Bryn Mawr '11): continual knowledge transfer using sparse coding  
– Continued to PhD studies in theoretical mathematics at Stanford  
– Awards: NSF Graduate Research Fellowship
- Samantha Wood (Bryn Mawr '11): machine learning for a priori matrix reordering algorithm selection  
– Continued to PhD studies in computer science at UC San Diego  
– Awards: NSF Graduate Research Fellowship

- Secondary advisor for honors thesis (primary advisors: David Wonnacott, Michelle Mills Strout).
- Alexandra Lee (Bryn Mawr '11): constrained community detection
  - Continued to graduate studies in applied math at the University of Washington
- Stephanie Tran (Bryn Mawr '13): learning for search and rescue in USARsim
- Rachael Mansbach (Swarthmore '11): community discovery in relational networks
  - Continued to PhD studies in physics at the University of Illinois, Urbana Champaign
- John Stevenson (UMBC '08): multiresolution learning
- Eric Hamilton (UMBC '07): multiscale image processing
- Craig Cambias (UMBC '05): annotated constrained clustering
  - Continued to graduate studies at Georgia Tech

## HONORS AND AWARDS

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- IJCAI-16 Distinguished Student Paper Award for “Using task features for zero-shot knowledge transfer in lifelong learning” with my two PhD advisees: David Isele and Mohammad Rostami. July 2016.
- Best paper award nominee at IJCAI-15 for “Autonomous cross-domain knowledge transfer in lifelong policy gradient reinforcement learning.” July 2015.
- First place in PLDI-11 Student Research Competition, Undergraduate Category for poster by Samantha Wood. June 2011.
- Lockheed Martin SPOT Awards (2): for research and proposal leadership. December 2009, May 2010.
- NASA Tech Brief Award for “Learning user preferences for sets of objects.” February 2008.
- Verizon Graduate Fellowship. Duration: August 2005 – January 2006.
- Goddard Earth Sciences and Technology Graduate Fellowship, \$60,000 plus tuition and benefits. Duration: August 2003 – August 2005.

## TEACHING

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**Courses Taught** (\* denotes new courses I developed; † denotes co-taught courses. Undergraduate courses are numbered below 499; graduate courses are numbered 500 and above.)

University of Pennsylvania

*CIS 700 Integrated Intelligence for Robotics	Fall 2017, Fall 2016, Fall 2015
*CIS 419/519 Introduction to Machine Learning	Fall 2017, Fall 2016, Fall 2015, Fall 2014
CIS 110 Introduction to Computer Programming	S'18, S'17, S'16, S'15, S'14†, F'13†

Bryn Mawr College

*CMSC 380 Computational Sustainability & Assistive Computing	Fall 2010
*CMSC 380 Machine Learning	Spring 2011
*CMSC 380 Social Network Analysis	Spring 2013
CMSC 372 Artificial Intelligence	Spring 2012
CMSC 312 Computer Graphics	Fall 2010
CMSC 246 Programming Paradigms in C/C++	Spring 2013
CMSC 206 Data Structures	Fall 2012, Spring 2012, Fall 2011
CMSC 110 Introduction to Computing	Fall 2012†, Fall 2011, Spring 2011

Swarthmore College

CPSC 063 Artificial Intelligence	Fall 2009
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University of Maryland, Baltimore County

CMSC 471 Artificial Intelligence	Fall 2007
CMSC 203 Discrete Mathematics	Spring 2005
CMSC 121 Introduction to UNIX	Fall 2006 (2 sections), Fall 2005

### Other Teaching and Mentoring Activities

- Honors Examiner for Artificial Intelligence, Swarthmore College (2016).
- Mentor, AAI Doctoral Consortium (2014, 2015, 2017).
- Primary “Major Advisor” for Bryn Mawr College computer science majors (2012–2013).
- Faculty co-advisor for Bryn Mawr College RoboCup Soccer Team (2012–2013).
- Lecture on AI to middle-school students as part of the Summer Institute for the Gifted @ Bryn Mawr (2011).

- “Customer” for software development teams, CMSC 345: Software Design and Development, UMBC (Spring 2007, Spring 2006, Spring 2005, Fall 2004, Spring 2004).
- Academic adviser for incoming UMBC undergraduates and transfer students (2004–2005).
- Graduate student mentor for the UMBC CSEE Department (2004–2005).

## PROFESSIONAL SERVICE

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### Conference and Symposium Organization

- Co-chair, EAAI Symposium on Educational Advances in Artificial Intelligence (2018).
- Co-chair, EAAI Symposium on Educational Advances in Artificial Intelligence (2017).
- Co-chair, IJCAI-16 Doctoral Consortium (2016).
- Co-chair, AAAI-15 Workshop on Knowledge, Skill, and Behavior Transfer in Autonomous Robots (2015).
- Co-chair, AAAI Fall Symposium on Knowledge, Skill, and Behavior Transfer in Autonomous Robots (2014).
- Co-chair, AAAI-14 Workshops Program, the 28th AAAI Conference on Artificial Intelligence (2014).
- Organizing Committee, EAAI Symposium on Educational Advances in Artificial Intelligence (2014).
- Chair, AAAI Spring Symposium on Lifelong Machine Learning (2013).
- Co-chair, AAAI-13 Workshops Program, the 27th AAAI Conference on Artificial Intelligence (2013).
- Organizing Committee, EAAI Symposium on Educational Advances in Artificial Intelligence (2013).

### Professional Committees

- Member, AAAI/EAAI Outstanding Educator Award committee (2016).

### Journal Editing

- Editor-in-chief (joint with A. McGovern), *AI Matters*: the ACM SIGAI Quarterly Newsletter (2015–present).
- Guest co-editor (with Carla Gomes and Brian Williams), special issues of *AI Magazine* on Computational Sustainability (2014).

### Journal Reviewing

- Journal of Machine Learning Research: 2014, 2016
- Machine Learning: 2012–2013
- Artificial Intelligence: 2014–2015
- Journal of Artificial Intelligence Research: 2011–2013
- Autonomous Agents and Multi-Agent Systems: 2012
- IEEE Transactions on Neural Networks and Learning Systems: 2012
- Data Mining and Knowledge Discovery: 2009
- IEEE Transactions on Knowledge and Data Engineering: 2008–2009

### Conference Committees

#### *Area Chair*

- AAAI Conference on Artificial Intelligence: 2018

#### *Senior Program Committees*

- AAAI Conference on Artificial Intelligence: 2013, 2016, 2017
- International Joint Conference on Artificial Intelligence (IJCAI): 2015, 2016, 2017, 2018
- International Conference on Autonomous Agents and Multiagent Systems (AAMAS): 2018

#### *Program Committees*

- AAAI Conference on Artificial Intelligence:
  - Main technical program: 2012, 2014, 2015
  - Computational Sustainability track: 2011–2013, 2015
  - Integrated Intelligence track: 2010–2011
  - AI and the Web track: 2013
- EAAI Symposium on Educational Advances in Artificial Intelligence: 2012, 2016
- ICML International Conference on Machine Learning: 2009, 2018
- IJCAI International Joint Conference on Artificial Intelligence: 2011
- Workshops:
  - AAMAS-17 Workshop on Transfer in Reinforcement Learning

**Other Conference, Reviewing, and Outreach Activities**

- NSF grant review panelist, Robust Intelligence program (2015, 2017).
- Reviewer, COLT Conference on Learning Theory (2015).
- Invited participant, DARPA ISAT Workshop on the “Training of Things” (2014).
- Judge, Indoor Aerial Robotics Competition, Drexel University (2012).
- Conference paper co-reviewer:
  - AAAI-05, the 20th Conference on Artificial Intelligence (2005).
  - ICML-05, the 22nd International Conference on Machine Learning (2005).
  - IJCAI-05, the International Joint Conference on Artificial Intelligence (2005).
  - ICML-04, the 21st International Conference on Machine Learning (2004).
- Judge, the 26th Annual UMB/UMBC Graduate Research Conference (2004).

**University of Pennsylvania Service**

- Member, CIS Machine Learning Curriculum committee (2017).
- Advisor, CIS 400 Senior Project teams (2013, 2014, 2015, 2016, 2017).
- Coordinator of Teaching Assistants for CIS core courses (Spring 2015).

**Bryn Mawr College Service**

- Member, Computer Science Lecturer search committee (2013).
- Clare Boothe Luce scholarship committee (2013).
- Primary “Major Advisor” for computer science majors (2012–2013).
- Member, Computer Science System Administrator / Lab Coordinator search committee (2012).
- Coordinator of guest speakers for FLICS Fantastic Lectures in Computer Science series (2011–2012).
- Organized showcase and discussion of SIGGRAPH videos (2010).
- Bryn Mawr organizer for student research showcase at Haverford College (2010).

**UMBC Service**

- Revised CS Graduate Student Handbook and Progress Checklists (2007).
- Member, Provost’s Student Advisory Committee (2004–2005).
- Student Member, CSEE Department Promotion and Tenure Committee (2004, 2003).
- Co-Organizer, CSEE Department “Hi-Tea” Weekly Social Forum (S’2007, F’2006, F’2004, S’2004).
- CSEE Representative, Graduate School Horizons program (Summer 2004, Summer 2003).
- Panelist, College of Engineering and Information Technology Summer Preview Days (Summer 2004).
- Sole Student Member, CSEE Department Chair Search Committee (Fall 2003).