Mark **Edmonds**

Artifical Intelligence Researcher · Robotics Researcher

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Education

University of California, Los Angeles — *Los Angeles, CA*

Ph.D. in Computer Science, Artifical Intelligence Concentration; Advisor: Prof. Song-Chun Zhu — *Sep 2017 - Present*

University of California, Los Angeles — *Los Angeles, CA*

M.S. in Computer Science; Thesis Advisor: Prof. Song-Chun Zhu — *Sep 2015 - Jun 2017*

University of Dayton — *Dayton, OH*

B.S. in Computer Engineering; Magna Cum Laude; Thesis Advisor: Prof. Tarek Taha — *Aug 2011 - May 2015*

Research Interests

Causal Learning	Causal model induction through simulation and exploration
Reinforcement Learning	Transfer learning and domain adaptation
Robotics	Learning from demonstration and transfer learning

Journal Publications

[1] **Mark Edmonds**, Tanvir Atahary, Scott Douglass, Tarek Taha.
"Hardware Accelerated Semantic Declarative Memory Systems through CUDA and MapReduce," *TPDS 2018.*

Conference Publications

[7] **M. Edmonds**, S. Qi, Y. Zhu, J. Kubricht, S.C. Zhu, H. Lu.
"Decomposing Human Causal Learning: Bottom-up Associative Learning and Top-down Schema Reasoning," *CogSci 2019.*

[6] **M. Edmonds***, J. Kubricht*, Colin Summers, Y. Zhu, B. Rothrock, S.C. Zhu, H. Lu. ***Oral Pres.***
"Human Causal Transfer: Challenges for Deep Reinforcement Learning," *CogSci 2018.*

[5] X. Xie*, H. Liu*, **M. Edmonds**, F. Gao, S. Qi, Y. Zhu, B. Rothrock, S.C. Zhu.
"Unsupervised Learning of Hierarchical Models for Hand-Object Interactions," *ICRA 2018.*

[4] **M. Edmonds***, F. Gao*, X. Xie, H. Liu, S. Qi, Y. Zhu, B. Rothrock, & S.C. Zhu. ***Oral Pres.***
"Feeling the Force: Integrating Force and Pose for Fluent Discovery through Imitation Learning to Open Medicine Bottles," *IROS 2017.*

[3] H. Liu*, X. Xie*, M. Millar*, **M. Edmonds**, F. Gao, Y. Zhu, V. Santos, B. Rothrock, & S.C. Zhu. ***Oral Pres.***
"A Glove-based System for Studying Hand-Object Manipulation via Pose and Force Sensing," *IROS 2017.*

[2] **M. Edmonds**, T. Atahary, T. Taha, & S. Douglass.
"High Performance Declarative Memory Systems through MapReduce," *SNPD 2015.*

[1] D. Prince, **M. Edmonds**, A. Sutter, M. Cusumano, W. Lu, & V. Asari.
"Brain Machine Interface using Emotiv EPOC to control Robai Cyton Robotic Arm," *NAECON 2015.*

(* indicates equal contribution)

Research

Causal Transfer Learning — *Los Angeles, CA*

Graduate Student Researcher; Center for Vision, Cognition, Learning, and Autonomy (VCLA) — *Sep 2017 – Present*

- Examining how causal knowledge can be incorporated into reinforcement learning to enable better knowledge transfer across task and environment domains.
- Decomposed human causal learning into two components: a bottom-up associative learning scheme and a top-down structure learning scheme.
- Studied how humans perform in causal transfer tasks and compared performance against state-of-the-art reinforcement learning algorithms.

Imitation Learning using Tactile Feedback *Los Angeles, CA*

Graduate Student Researcher; Center for Vision, Cognition, Learning, and Autonomy (VCLA) *Sep 2015 – Sep 2017*

- Transferred visually latent causal changes from a human demonstrator to a robot using a tactile glove and an And-Or graph through autoencoders and neural networks.
- The manipulation policy uses the And-Or graph to encode long-term temporal constraints and uses haptic feedback to incorporate real-time sensor data.
- Deployed robot localization on a ROS-based Baxter robot combining SLAM (using RGB-D and LIDAR), wheel odometry, and IMU data through Kalman filtering.

Declarative Memory Acceleration *Dayton, OH*

Undergraduate Researcher; Air Force Research Lab (AFRL) *May 2014 – Sep 2015*

- Accelerated the declarative memory module of AFRL's CECEP cognitive architecture (based on ACT-R).
- The research focused on leveraging the parallelization of CUDA, yielding a 100x speedup over the fastest existing implementation. Utilized CUDA, thread pools, ontology parsers, and IPC.

Experience

International Center for AI and Robot Autonomy *Los Angeles, CA*

Robotics Research Engineer Intern *Jun 2018 - Present*

- Working on transfer learning approaches for robotics research to transfer symbolic and haptic information between environments and embodiments.

Santa Monica College *Santa Monica, CA*

Adjunct Professor, Computer Science Department *Jun 2016 - Present*

- CS 80, Internet Programming, a class focused on HTML, CSS, JavaScript, MySQL, and PHP.
- CS 50, Introduction to C Programming, a class focused on C fundamentals.
- CS 52, Introduction to C++ Programming, a class focused on C++ fundamentals.

Garmin International *Olathe, KS*

Software Engineering Intern, Aviation Department *May 2013 - Aug 2013*

- Reduced testing time by 40% for the Datalink team, saving hundreds of vendor-certification testing time hours.

Cristo Rey Kansas City High School *Kansas City, MO*

Teacher and Tutor *May 2011 - Aug 2012*

- Pre-calculus and chemistry tutor and teacher at an inner city high school.

Skills

Programming	Python, C/C++, Shell, LaTeX, Matlab, Javascript, HTML5, CSS, Node.JS, Java, CUDA
Topics	Machine Learning, Graphical Models, Reinforcement Learning, Bayesian Networks, Statistical Modeling
Teaching	Introduction to C, Introduction to C++, Internet Programming

Honors & Awards

2017	**NSF Doctoral Consortium**, IROS 2017	*Vancouver, CA*
2015	**The Anthony Horvath and Elmer Steger Award of Excellence**, University of Dayton	*Dayton, OH*
2014	**Eta Kappa Nu IEEE Honor Society**, Member	*Dayton, OH*
2014	**Tau Beta Pi Engineering Honor Society**, Member	*Dayton, OH*
2011	**Eagle Scout**, Boy Scouts of America	*Kansas City, KS*

Invited Talks

Causal Transfer: Challenges for Causal Learning and Reinforcement Learning *White Mountain, NH*

ONR MURI Meeting *Sep 2018*

Human Causal Transfer: Challenges for Deep Reinforcement Learning *Madison, WI*

CogSci Oral Presentation *Jul 2018*

Causal Imitation: The Necessity of Integrating Observations and Interventions *Pittsburgh, PA*

RSS Causal Imitation Workshop *Jun 2018*

Feeling the Force: Integrating Force and Pose for Imitation Learning *Mountain View, CA*

CoRL Lightning Talk *Nov 2017*

Feeling the Force: Integrating Force and Pose for Imitation Learning *Los Angeles, CA*

ONR MURI Meeting *Aug 2017*