

Education

University of California, Los Angeles

Ph.D. in Computer Science, Artificial Intelligence Concentration; Advisor: Prof. Song-Chun Zhu

Los Angeles, CA

Sep 2017 - Present

University of California, Los Angeles

M.S. in Computer Science; Thesis Advisor: Prof. Song-Chun Zhu

Los Angeles, CA

Sep 2015 - Jun 2017

University of Dayton

B.S. in Computer Engineering; Magna Cum Laude; Thesis Advisor: Prof. Tarek Taha

Dayton, OH

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

- [8] **M. Edmonds**, X. Ma, S. Qi, Y. Zhu, H. Lu, S.C. Zhu *Oral Pres.*
“Theory-based Causal Transfer: Integrating Instance-level Induction and Abstract-level Structure Learning,” *AAAI 2020*.
- [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

Graduate Student Researcher; Center for Vision, Cognition, Learning, and Autonomy (VCLA)

Los Angeles, CA

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

Graduate Student Researcher; Center for Vision, Cognition, Learning, and Autonomy (VCLA)

Los Angeles, CA

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

Undergraduate Researcher; Air Force Research Lab (AFRL)

Dayton, OH

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

Robotics Research Engineer Intern

Los Angeles, CA

Jun 2018 - Present

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

Santa Monica College

Adjunct Professor, Computer Science Department

Santa Monica, CA

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

Software Engineering Intern, Aviation Department

Olathe, KS

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

Teacher and Tutor

Kansas City, MO

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

ONR MURI Meeting

White Mountain, NH

Sep 2018

Human Causal Transfer: Challenges for Deep Reinforcement Learning

CogSci Oral Presentation

Madison, WI

Jul 2018

Causal Imitation: The Necessity of Integrating Observations and Interventions

RSS Causal Imitation Workshop

Pittsburgh, PA

Jun 2018

Feeling the Force: Integrating Force and Pose for Imitation Learning

CoRL Lightning Talk

Mountain View, CA

Nov 2017

Feeling the Force: Integrating Force and Pose for Imitation Learning

ONR MURI Meeting

Los Angeles, CA

Aug 2017