

# Mark Edmonds

Artificial Intelligence Researcher · Robotics Researcher

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## Education

### University of California, Los Angeles

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

Los Angeles, CA

September 2017 - Present

### University of California, Los Angeles

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

Los Angeles, CA

September 2015 - June

2017

### University of Dayton

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

Dayton, OH

August 2011 - May 2015

## Research Interests

**Causality** 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 *TPDS 2018*  
*Hardware Accelerated Semantic Declarative Memory Systems through CUDA and MapReduce*

## Conference Publications

- [6] **M. Edmonds\***, J. Kubricht\*, Colin Summers, Y. Zhu, B. Rothrock, S.C. Zhu, H. Lu *CogSci 2018*  
*Human Causal Transfer: Challenges for Deep Reinforcement Learning* **Oral Pres.**
- [5] X. Xie\*, H. Liu\*, **M. Edmonds**, F. Gao, S. Qi, Y. Zhu, B. Rothrock, S.C. Zhu *ICRA 2018*  
*Unsupervised Learning of Hierarchical Models for Hand-Object Interactions*
- [4] **M. Edmonds\***, F. Gao\*, X. Xie, H. Liu, S. Qi, Y. Zhu, B. Rothrock, & S.C. Zhu *IROS 2017*  
*Feeling the Force: Integrating Force and Pose for Fluent Discovery through Imitation Learning to Open Medicine Bottles* **Oral Pres.**
- [3] H. Liu\*, X. Xie\*, M. Millar\*, **M. Edmonds**, F. Gao, Y. Zhu, V. Santos, B. Rothrock, & S.C. Zhu *IROS 2017*  
*A Glove-based System for Studying Hand-Object Manipulation via Pose and Force Sensing* **Oral Pres.**
- [2] **M. Edmonds**, T. Atahary, T. Taha, & S. Douglass *SNPD 2015*  
*High Performance Declarative Memory Systems through MapReduce*
- [1] D. Prince, **M. Edmonds**, A. Sutter, M. Cusumano, W. Lu, & V. Asari *NAECON 2015*  
*Brain Machine Interface using Emotiv EPOC to control Robai Cyton Robotic Arm*

(\* indicates equal contribution)

## Research

### Causal Transfer Learning

Los Angeles, CA

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

Sept 2017 – Present

- Examining how causal knowledge can be incorporated into reinforcement learning to enable better knowledge transfer across task and environment domains.
- 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

Sept 2015 – Sept 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 – Sept 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

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### Santa Monica College

Adjunct Professor

Santa Monica, CA

June 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, Aviation Department

Software Engineering Intern

Olathe, KS

May 2013 - August 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 - August 2012

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

## Skills

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**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

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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

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### Causal Transfer: Challenges for Causal Learning and Reinforcement Learning

ONR MURI Meeting

White Mountain, NH

Sept 2018

### Human Causal Transfer: Challenges for Deep Reinforcement Learning

CogSci Oral Presentation

Madison, WI

July 2018

### Causal Imitation: The Necessity of Integrating Observations and Interventions

RSS Causal Imitation Workshop

Pittsburgh, PA

June 2018

### Feeling the Force: Integrating Force and Pose for Imitation Learning

CoRL Lightning Talk

Mountain View, CA

November 2017

### Feeling the Force: Integrating Force and Pose for Imitation Learning

ONR MURI Meeting

Los Angeles, CA

August 2017