

# Mark Edmonds

ARTIFICIAL INTELLIGENCE RESEARCHER · ROBOTICS RESEARCHER

✉ mark@mjedmonds.com | 🏠 www.mjedmonds.com | 📧 mjedmonds | 🌐 mjedmonds

## Education

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### 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

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**Causality** Causal model induction through simulation and exploration

**Reinforcement Learning** Transfer learning and domain adaptation

**Robotics** Learning from demonstration and transfer learning

## Journal Publications

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

## Conference Publications

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- [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

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### 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

*White Mountain, NH*

ONR MURI Meeting

*Sept 2018*

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

*Madison, WI*

CogSci Oral Presentation

*July 2018*

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

*Pittsburgh, PA*

RSS Causal Imitation Workshop

*June 2018*

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

*Mountain View, CA*

CoRL Lightning Talk

*November 2017*

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

*Los Angeles, CA*

ONR MURI Meeting

*August 2017*