

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] Y. Zhu, T. Gao, L. Feng, S. Huang, **M. Edmonds**, H. Liu, F. Gao, C. Zhang, S. Qi, Y.N. Wu, J. Tenenbaum, S.C. Zhu
“Dark, Beyond Deep: A Paradigm Shift to Cognitive AI with Humanlike Common Sense,” *Engineering* 2020.
- [2] **M. Edmonds***, F. Gao*, H. Liu*, X. Xie*, S. Qi, B. Rothrock, Y. Zhu, Y.N. Wu, H. Lu, S.C. Zhu
“A tale of two explanations: Enhancing human trust by explaining robot behavior,” *Science Robotics* 2019.
- [3] **M. Edmonds**, T. Atahary, S. Douglass, T. Taha.
“Hardware Accelerated Semantic Declarative Memory Systems through CUDA and MapReduce,” *TPDS* 2018. (* indicates equal contribution)

Conference Publications

- [1] **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.
- [2] **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.
- [3] **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.
- [4] 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.
- [5] **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.
- [6] 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.
- [7] **M. Edmonds**, T. Atahary, T. Taha, & S. Douglass.
“High Performance Declarative Memory Systems through MapReduce,” *SNPD* 2015.
- [8] 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, an And-Or graph, 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) by leveraging the parallelization of CUDA, yielding a 100x speedup over the fastest existing implementation.
- Utilized CUDA, thread pools, and IPC to achieve the speedup.

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 by optimizing timing protocols while adhering to safety standards, saving hundreds of vendor-certification testing time hours.

Cristo Rey Kansas City High School

Kansas City, MO

Summer School Teacher

May 2011 - Aug 2012

- Pre-calculus and chemistry teacher at an inner city high school focused on college placement for underrepresented demographics.

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