

Richard Kelley

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Online

www.richardkelley.io
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RESEARCH INTERESTS

Human-Robot Interaction, Motion Planning, Machine Learning, Automated Vehicles, Unmanned Aircraft.

EDUCATION

Doctor of Philosophy, Computer Science and Engineering May 2013
University of Nevada, Reno, NV
DISSERTATION - Models of Intention for Human-Robot Interaction
Advisor: Monica Nicolescu

Master of Science, Computer Science May 2009
University of Nevada, Reno, NV
THESIS - Mind Reading for Social Robots: Stochastic Models of Intent Recognition
Advisor: Monica Nicolescu

Bachelor of Science, Mathematics June 2006
Minor: Philosophy
University of Washington, Seattle, WA

PROFESSIONAL EXPERIENCE

Nevada Center for Applied Research, University of Nevada June 2017 – Present
Senior Engineer

- Draft and submit grant proposals for research on intelligent transportation and robotics.
- Develop software and algorithms for autonomous ground vehicles.
- Develop software for connected infrastructure systems.
- Provide technical support to State of Nevada Unmanned Aircraft System FAA Test Site.

Nevada Advanced Autonomous Systems Innovation Center, University of Nevada June 2015 – June 2017
Senior Engineer

- Research and develop unmanned aircraft systems technology.
- Work with partner companies to develop and commercialize UAV technology.
- Develop software and algorithms for autonomous ground vehicles.
- Develop software for connected infrastructure systems.

Eigenmancy, LLC June 2014 – June 2018
Cofounder

- Founded a data science/machine learning consulting firm.
- Assisted companies with exploratory data analysis and statistical model development.
- Administered AWS infrastructure for client companies.

Robotics Research Lab and Cyberinfrastructure Lab, University of Nevada May 2013 – June 2015
Research Assistant (Robotics Lab) and Data Portal Manager (Cyberinfrastructure Lab)

- Conduct robotics and artificial intelligence research.
- Assist in the development and operation of the Nevada Climate Change Portal.

Cyberinfrastructure Lab, University of Nevada
Graduate Research Assistant

January 2013 – May 2013

- Assist in the development and operation of the Nevada Climate Change Portal.

Robotics Research Lab, University of Nevada
Graduate Research Assistant

2006 – May 2013

- Design and implement novel algorithms to enable robots to engage in social interaction with humans.
- Author papers describing my research in social robotics and artificial intelligence.

Department of Mathematics, University of Washington
Student researcher

Summer 2005

- Research computational complexity in the context of combinatorial optimization problems.

Disabled Student Services, University of Washington
Technical editor

2004 – 2006

- Prepare technical books for conversion to Braille and other accessible formats using L^AT_EX.

TECHNICAL SKILLS

The Basics

- Regular Linux user (Ubuntu, Slackware, Arch).
- Comfortable in a Windows development environment.

Programming Languages

- *Current significant use:* Modern C++, Python.
- *Previous significant use:* Common Lisp, JavaScript, C, CUDA (C/C++).

Systems

- ROS (12 Years)
- PyTorch/LibTorch (5 years/3 years)
- GTSAM (3 years)

MAJOR GRANTS & CONTRACTS

The Digital Twin Paradigm for Real-Time Transit Infrastructure Maintenance

2021-2022

Sponsor: Washoe County Regional Transportation Commission / Federal Transit Administration

Amount: \$130,500.55

Role: PI

Unmanned Aircraft Systems Test Sites IDIQ Task Order 1

2016

Sponsor: Nevada Institute for Autonomous Systems

Amount: \$136,828

Role: PI

UAS Traffic Management Support

2015-2020

Sponsor: NASA Ames Research Center

Amount: \$249,970

Role: PI

INVITED TALKS

- Title: *Navigating the Virtual Road to Autonomous Driving: Using Simulations to Test, Train, and Validate Autonomous Vehicles* October 2020
Sponsor: American Bar Association
Location: Online continuing legal education
- Title: *Maximizing the Societal Benefit of Robots and Autonomous Cars during a Pandemic* May 2020
Sponsor: Istanbul Bar Association
Location: Online talk
- Title: *Science Distilled: Robot Revolution?* April 2019
Sponsor: The Discovery Museum
Location: Reno, NV
- Title: *Apollo-Driven Intelligent Mobility in Nevada* August 2018
Sponsor: Baidu, Inc.
Location: The Computer History Museum, Mountain View
- Title: *Intelligent Mobility in Nevada* September 2017
Sponsor: Ford Motor Company
Location: Ford Research and Innovation Center, Palo Alto

PUBLICATIONS

- E. Duong, J. Poston, R. Kelley, "Predicting Agents' Trajectories by Estimating Their Motion Planners," *RSS 2020 Workshop on Interaction and Decision-Making in Autonomous Driving*. 2020.
- J. Blankenburg, R. Kelley, D. Feil-Seifer, R. Wu, L. Barford, F. Harris, "Towards GPU-Accelerated PRM for Autonomous Navigation," *International Conference on Information Technology: New Generations*. 2020.
- H. Lucas, R. Kelley, "Generating Control Policies for Autonomous Vehicles Using Neural ODEs," *Workshop on Integration of Deep Neural Models and Differential Equations, International Conference on Learning Representations*. 2020.
- K. Wagner, R. Harding, R. Kelley, B. Labus, S. Verdugo, E. Copulsky, J. Bowles, M. Mittal, P. Davidson, "Post-overdose interventions triggered by calling 911: Centering the perspectives of people who use drugs (PWUDs)," *PLOS One*. 2019.
- B. Miller, R. Kelley, "Inverse Reinforcement Learning for Model Predictive Control of a Self-Driving Car," *Women in Machine Learning Workshop at Neural Information Processing Systems*. 2018.
- V. Le, C. Carthen, R. Kelley, T. Kozubowski, F. Harris, "Rewind: An Automatic Music Transcription Web Application," *International Journal of Computers and Their Applications*. 2017.
- C. Carthen, R. Kelley, C. Ruggieri, S. Dascalu, J. Colby, F. Harris, "MUSE: A Music Conducting Recognition System," *Information Technology - New Generations. Advances in Intelligent Systems and Computing*. 2017.
- B. Rekabdar, M. N. Nicolescu, M. Nicolescu, M. Saffar, R. Kelley, "A Scale and Translation Invariant Approach for Early Classification of Spatio-Temporal Patterns Using Spiking Neural Networks," *Neural Processing Letters*. 2016.

- R. Kelley, "Sequence Modeling with Recurrent Tensor Networks," *openreview.net*. 2016.
- B. Rekabdar, M. N. Niclescu, R. Kelley, M. Niclescu. "An Unsupervised Approach to Learning and Early Detection of Spatio-Temporal Patterns Using Spiking Neural Networks," *Journal of Intelligent and Robotic Systems*. 2015.
- V. Le, M. Neff, R. Stewart, R. Kelley, E. Fritzinger, S. Dascalu, F. Harris Jr., "Microservice-based architecture for the NRDC," *International Conference on Industrial Informatics*. 2015.
- B. Rekabdar, M. N. Niclescu, M. Niclescu, R. Kelley, "Scale and translation invariant learning of spatio-temporal patterns using longest common subsequences and spiking neural networks," *International Joint Conference on Neural Networks*. 2015.
- B. Rekabdar, M. N. Niclescu, M. Niclescu, R. Kelley, "A biologically inspired approach to learning spatio-temporal patterns," *International Conference on Developmental Learning and on Epigenetic Robotics*. 2015.
- B. Rekabdar, M. N. Niclescu, R. Kelley, M. Niclescu. "Unsupervised Learning of Spatio-temporal Patterns Using Spike Timing Dependent Plasticity," *International Conference on Artificial General Intelligence*. 2014.
- R. Kelley, A. Tavakkoli, C. King, A. Ambardekar, L. Wigand, M. Niclescu and M. Niclescu, "Intent Recognition for Human-Robot Interaction," *Plan, Activity, and Intent Recognition*, 2013.
- R. Kelley, A. Tavakkoli, C. King, A. Ambardekar, M. Niclescu, M. Niclescu, "Context-Based Bayesian Intent Recognition," *IEEE T. Autonomous Mental Development* 4(3): 215-225 (2012).
- D. Ennis, A. Medaille, T. Lambert, R. Kelley, F. Harris, "A Comparison of Academic Libraries: An Analysis Using a Self-Organizing Map," *Library Science*, 2012.
- R. Kelley, L. Wigand, B. Hamilton, K. Browne, M. Niclescu, M. Niclescu, "Deep networks for predicting human intent with respect to objects," *HRI 2012*. 171-172.
- T. Kollar, A. Weiss, J. Monast, A. Austermann, D. Lu, M. Patel, E. Gribovskaya, C. Datta, R. Kelley, H. Osawa, L. Lin, *HRI pioneers workshop 2011*. HRI 2011: 9-10.
- R. Kelley, A. Ambardekar, L. Wigand, M. Niclescu, M. Niclescu, "Point Clouds and Range Images for Intent Recognition and Human-Robot Interaction," *RGB-D Workshop: Advanced Reasoning with Depth Cameras*, 2011.
- L. Barford, I. Gibbs, R. Kelley, "Toward Real-Time Kernel Density Estimate Display for Instrumentation," *IEEE Instrumentation and Measurement Technology Conference*, 2011.
- R. Kelley, E. Schaerer, M. Gomez, M. Niclescu, "Liability in Robotics: An International Perspective on Robots as Animals," *Advanced Robotics, Special Issue on Legal and Safety Constraints for Service Robots Deployment*, 2010.
- R. Kelley, C. King, A. Ambardekar, M. Niclescu, M. Niclescu, A. Tavakkoli, "Integrating Context into Intent Recognition Systems," *Proceedings of the International Conference on Informatics in Control, Automation and Robotics*, 2010.
- R. Kelley, A. Tavakkoli, C. King, M. Niclescu, M. Niclescu, "Understanding Activities and Intentions for Human-Robot Interaction," *Advances in Human-Robot Interaction*, 2009.
- R. Kelley, M. Niclescu, M. Niclescu, S. Louis, "An Evolutionary Approach to Maximum Likelihood Estimation for Generative Stochastic Models," *Proceedings of the 40th International Symposium on Robotics*,

2009.

R. Kelley, M. Nicolescu, M. Nicolescu, "Grammar-Based Robot Control," *Proceedings of the 8th International Conference on Autonomous Agents and Multiagent Systems*, 2009.

E. Schaerer, R. Kelley, M. Nicolescu, "Robots as Animals: A Framework for Liability and Responsibility in Human-Robot Interactions," *Proceedings of the 18th IEEE Symposium on Robot and Human Interactive Communication*, 2009.

R. Kelley, C. King, A. Tavakkoli, M. Nicolescu, M. Nicolescu, G. Bebis, "An Architecture for Understanding Intent Using a Novel Hidden Markov Formulation," *International Journal of Humanoid Robotics, Special Issue on Cognitive Humanoid Robots*, 2008.

R. Kelley, A. Tavakkoli, C. King, M. Nicolescu, M. Nicolescu, G. Bebis, "Understanding Human Intentions via Hidden Markov Models in Autonomous Mobile Robots," *Proceedings of the 3rd International Conference on Human-Robot Interaction*, 2008.

A. Tavakkoli, R. Kelley, C. King, M. Nicolescu, M. Nicolescu, G. Bebis, "A Visual Tracking Framework for Intent Recognition in Videos," *Proceedings of the International Symposium on Visual Computing*, 2008.

A. Tavakkoli, R. Kelley, C. King, M. Nicolescu, M. Nicolescu, G. Bebis, "A Vision- Based Architecture for Intent Recognition," *Proceedings of the International Symposium on Visual Computing*, Vol. II, pp 173-182, 2007.

TEACHING

CSE 493/693 - Directed Study: Unsupervised Learning Spring 2017

Lead Instructor

- Introduced core algorithms for neural networks.
- Introduced concepts, mathematics, and implementation of generative adversarial networks.
- Introduced concept of variational inference.
- Introduced concept and implementation of variational autoencoders.

CSE 793 - Independent Study: Deep Natural Language Processing Spring 2017

Lead Instructor

- Introduced core algorithms for neural networks.
- Introduced unsupervised algorithms for word modeling.
- Covered recurrent neural networks for sentence processing.

CSE 491/691 - Foundations of Autonomous Systems: Math, Minds, and Machines Fall 2016

Lead Instructor

- Provided overview of formal systems, discrete math, and theoretical computer science with application to Artificial Intelligence.
- Gave introduction to programming with the lambda calculus.

CSE 491/691Q - Deep Learning Spring 2015

Lead Instructor

- Introduced seniors and beginning graduate students to the field of Deep learning.
- Designed lab sections to reinforce core course material.
- Course contents: Math review, machine learning overview, probability and statistics for regression and classification, gradient-based training, deep architectures, autoencoders, convolutional neural networks, neural language models, applications in speech, vision, and language processing.

CSE 482/682 - Introduction to Artificial Intelligence

Fall 2014, Fall 2015

Lead Instructor

- Taught seniors and beginning graduate students the basics of classical and modern artificial intelligence.
- Course contents: History of AI, agent-based systems, search algorithms, basic optimization, dynamic programming, reasoning under uncertainty, machine learning, neural networks.

CSE 491H/691H - Data Science & Big Data

Spring 2014

Lead Instructor

- Taught seniors and beginning graduate students how to work with large data sets and do machine learning in practical settings.
- Designed lab sections to reinforce core course material.
- Course contents: Data science workflow, data visualization, basic exploratory statistics, introduction to Python, numerical computing in Python, regression, classification, Kaggle competitions, group data projects.

CSE 282 - Simulation Physics

Fall 2012

Lead Instructor

- Taught sophomores in Computer Science how to build simulations and computer games that use physics to increase realism.
- Designed lab sections to reinforce core course material.
- Supervised a TA for the purposes of grading and lab work.
- Course contents: basic kinematics and linear algebra, numerical solution of ordinary differential equations, implementing Newton's laws on a computer, 3D rotation via matrices and quaternions, rotational dynamics, efficient collision detection and resolution.

CSE 457/657 - Database Management Systems

Spring 2012

Lead Instructor

- Provided an overview of modern database and data mining technologies to seniors and beginning graduate students in Computer Science.
- Course contents: relational databases, SQL, database-backed web applications, Ruby on Rails, NoSQL databases, distributed key-value stores, document databases, graph databases, supervised and unsupervised machine learning in Python.

CSE 477/677 - Analysis of Algorithms

Fall 2011

Lead Instructor

- Taught design and analysis of algorithms to seniors and beginning graduate students in Computer Science.
- Course contents: basic asymptotic analysis, graph algorithms, greedy algorithms, dynamic programming, NP-completeness, and approximation algorithms.

College of Engineering Computer Science Summer Camp

2010 – 2013

Camp Designer and Instructor

- Created the College of Engineering's Computer Science Camp, focusing on 3D Graphics and Digital Art and Animation.
- Taught campers (aged 14 to 17) how to build and animate 3D models using open-source tools such as Blender.

ACADEMIC ADVISING

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|---|------------------------|
| Gaetano Evangelista Ph.D. in Computer Science and Engineering | Spring 2024 (expected) |
| Jamie Poston M.S. in Computer Science and Engineering Thesis: <i>Predicting Agent Behavior By Estimating Motion Planners</i> | Spring 2020 |
| Houston Lucas M.S. in Computer Science and Engineering Thesis: <i>Differentiable Boundary Value Problem Solver</i> | Spring 2020 |
| Niki Silveria M.S. in Computer Science and Engineering Thesis: <i>Optimal Strategy Imitation Learning from Differential Games</i> | Winter 2017 |

MEDIA COVERAGE

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| <i>Faces of the Pack: Jennifer Clayton discovers fascination for autonomous robotics</i> https://bit.ly/3ewjWdY | 30 August 2022 |
| <i>Is The Robotic Revolution Upon Us?</i> https://bit.ly/3qn3TBU KUNR Public Radio | 14 August 2019 |
| <i>Dell Luminaries Podcast: Artificial Intelligence ... Driving In the Streets</i> https://bit.ly/2PhXxTd | 23 October 2018 |
| <i>Apollo 3.0 Launch Event - Developer Highlight: Richard Kelley</i> https://bit.ly/2VaJ0aU | 9 August 2018 |
| <i>Can artificial intelligence help predict and prevent traffic accidents?</i> https://bit.ly/2VzM31D BBC Click | 22 January 2018 |
| <i>Proterra to test self-driving bus in downtown Reno</i> https://bit.ly/2LzOWKW SFGate | 2 May 2017 |
| <i>Don't Look Now, But Even Buses Are Going Autonomous</i> https://bit.ly/2pV69mD Wired Magazine | 2 May 2017 |
| <i>Drone Traffic Control</i> https://bit.ly/2Yn2gnI Breakground Magazine | 11 April 2017 |
| <i>NASA Marks Success for Most Complex Drone Traffic Management Test Yet</i> https://go.nasa.gov/1VHpCRj | 21 April 2016 |
| <i>Nevada researchers helping develop air traffic control for drones</i> https://bit.ly/30cK6qo | 7 August 2015 |

Las Vegas Sun

Drone delivery start-up Flirtey taking on Google, Amazon
<https://ab.co/2Hdb0vC>
ABC News

16 May 2015

ACADEMIC HONORS

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|---|------|
| <i>Graduate Regents' Scholar, University of Nevada</i> | 2013 |
| <i>Outstanding Graduate Student in Computer Science and Engineering, University of Nevada</i> | 2013 |
| <i>Phi Beta Kappa, University of Washington</i> | 2004 |
| <i>National Merit Scholar, University of Washington</i> | 2002 |

COMMUNITY WORK

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|---|-------------|
| <i>Northern Nevada Math Club</i> Volunteer Instructor | 2022 |
| <i>McQueen High School Speech and Debate</i> Assistant Coach | 2006 – 2008 |
| <i>McQueen High School Speech and Debate</i> Head Coach <ul style="list-style-type: none">• 2009 Northern Nevada Coach of the Year | 2008 – 2010 |
| <i>Northern Nevada Forensic League</i> Secretary | 2009 – 2010 |