

# Milad Memarzadeh

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Postdoctoral Scholar, University of California Berkeley  
407 McLaughlin Hall, UC Berkeley, Berkeley CA 94720

✉ [miladm@berkeley.edu](mailto:miladm@berkeley.edu) ☎ +1 540 557 7087 🌐 [miladm12](#) 🌐 [miladmemarzadeh.com](#)

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## Employment

### University of California Berkeley

Postdoctoral Scholar, *Civil & Environmental Engineering* July 2018 - present  
Postdoctoral Scholar, *Environmental Science, Policy & Management* Jan 2016 - June 2018  
Lecturer, *Civil & Environmental Engineering* Aug 2017- Dec 2017 (Fall 2017)

## Education

### Carnegie Mellon University

Ph.D., *Civil & Environmental Engineering*, **GPA: 4.0** Dec 2015  
Thesis: System-level Adaptive Monitoring and Control of Infrastructures: A POMDP-based Framework

### Virginia Tech

M.Sc., *Civil Engineering*, **GPA: 3.96** Dec 2012  
Thesis: Automated 2D Detection of Construction Resources in Support of Automated Performance Assessment of Construction Operations

### University of Tehran

B.Sc., *Civil Engineering*, **GPA: 17.11/20** Jun 2011

## Research interest

My research focuses on the development of theoretical and computational methods for understanding (e.g. uncertainty quantification), monitoring (e.g. uncertainty propagation), and controlling (e.g. decision optimization & adaptation) dynamics of systems such as our interdependent urban community, infrastructure, and landscape under the risk of such events. I plan to create a research group whose focus is on three synergistic fundamental core areas: (1) infrastructure resilience and recovery under the risk of extreme events, (2) adaptive management under uncertain and changing climate, and (3) sustainability of integrated food-energy-water systems.

## Publications

### Journal Articles:

*Under review & in preparation:*

- [1] **Milad Memarzadeh**, Scott Moura, and Arpad Horvath. “Optimizing dynamics of integrated food-energy-water systems under the risk of climate change”, in preparation.
- [2] **Milad Memarzadeh**, “Adaptive management of infrastructure systems with model-free deep reinforcement learning”, under review at *Journal of Infrastructure Systems*.
- [3] **Milad Memarzadeh**, Gregory Britten, Boris Worm, and Carl Boettiger. “New decision methods are needed to rebuild global fisheries”, under review at *Science Advances*.
- [4] **Milad Memarzadeh**, and Matteo Pozzi, “Bayesian nonparametric approach for quantifying resilience of infrastructure systems to extreme events”, in preparation.
- [5] Matteo Pozzi, and **Milad Memarzadeh**, “Multi-scale sequential decision making for resilience”, in preparation.
- [6] **Milad Memarzadeh**, and Matteo Pozzi, “Model-free reinforcement learning with safe exploration: Modeling resilience of infrastructure systems”, under review at *Structural Safety*.

*Published:*

- [7] **Milad Memarzadeh**, and Carl Boettiger (2018). “Resolving the measurement uncertainty paradox in ecological management”, *The American Naturalist*, accepted.
- [8] **Milad Memarzadeh**, and Carl Boettiger (2018). “Adaptive management of ecological systems under partial observability”, *Biological Conservation*, 224, 9–15.
- [9] Matteo Pozzi, **Milad Memarzadeh**, and Kelly Klima (2017). “Hidden-model processes for adaptive management under uncertain climate change”, *Journal of Infrastructure Systems*, 23(4), 04017022.
- [10] **Milad Memarzadeh**, and Matteo Pozzi (2016). “Value of information in sequential decision making: component inspection, permanent monitoring and system-level scheduling”, *Reliability Engineering and System Safety*, 154, 137–151.
- [11] **Milad Memarzadeh**, Matteo Pozzi, and J. Zico Kolter (2016). “Hierarchical modeling of systems with similar components: A framework for adaptive monitoring and control”, *Reliability Engineering and System Safety*, 153, 159–169.
- [12] **Milad Memarzadeh**, and Matteo Pozzi (2016). “Integrated inspection scheduling and maintenance planning for infrastructure systems”, *Computer-Aided Civil and Infrastructure Engineering*, 31(6), 403–415.
- [13] **Milad Memarzadeh**, Matteo Pozzi, and J. Zico Kolter (2014). “Optimal planning and learning in uncertain environments for the management of wind farms”, *Journal of Computing in Civil Engineering*, 29(5), 04014076.
- [14] **Milad Memarzadeh**, Mani Golparvar-Fard, and Juan Carlos Niebles (2013). “Automated 2D detection of construction equipment and workers from site video streams using histograms of oriented gradients and colors”, *Automation in Construction*, 32, 24-37.

[15] **Milad Memarzadeh**, Najmeh Mahjouri, Reza Kerachian (2013). “Evaluating sampling locations in river water quality monitoring networks: Application of dynamic factor analysis and discrete entropy theory”, *Environmental Earth Sciences*, 70 (6), 2577–2585.

[16] Sassan Aflaki, and **Milad Memarzadeh** (2011). “Using two-way ANOVA and hypothesis test in evaluating crumb rubber modification (CRM) agitation effects on rheological properties of bitumen”, *Construction and Building Materials*, 25(4), 2094–2106.

[17] Sassan Aflaki, and **Milad Memarzadeh** (2011). “Interpreting SuperPAVE PG test results with confidence intervals”, *Construction and Building Materials*, 25(6), 2777–2784.

### Conference Proceedings:

[1] George Roderick, Jeremy Andersen, Peter T. Oboyski, Neil Davies, Sylvain Charlat, Natalie Graham, Curtis Ewing, Henrik Krehenwinkel, **Milad Memarzadeh**, Chistopher Meyer, Suzuki Noriyuki, Carl Boettiger, and Rosemary Gillespie (2018). “Machine learning to categorize unidentified arthropods as invasive or endemic using DNA sequence signatures without a complete reference library: Impact on island ecosystems.”, *2018 ESA, ESC, and ESBC Joint Annual Meeting*, Vancouver, BC, Canada.

[2] **Milad Memarzadeh**, and Matteo Pozzi (2017). “Resilience to extreme events: A Bayesian non-parametric approach.”, *International Workshop on Structural Health Monitoring*, Stanford University, California, 2121-2128.

[3] Matteo Pozzi, and **Milad Memarzadeh** (2017). “A sequential decision making prospective on resilience.”, *ICOSSAR, 12th International Conference on Structural Safety and Reliability*, TU Wien, Vienna, Austria, 2633-2640.

[4] Konstantinos Papakonstantinou, and **Milad Memarzadeh** (2017). “Optimal maintenance and inspection planning for structural components under mixed and partial observability”, *ICOSSAR, 12th International Conference on Structural Safety and Reliability*, TU Wien, Vienna, Austria.

[5] **Milad Memarzadeh**, and Matteo Pozzi (2016). “System-level inspection scheduling using value of information: A fee-based formulation”, *IFIP-WG 7.5 Reliability and Optimization of Structural Systems*, Carnegie Mellon University, Pittsburgh, Pennsylvania.

[6] **Milad Memarzadeh**, and Matteo Pozzi (2015). “System-level inspection scheduling: An approach based on stochastic future allocation”, *International Workshop on Structural Health Monitoring*, Stanford University, California.

[7] **Milad Memarzadeh**, Matteo Pozzi, and J. Zico Kolter (2015). “Hierarchical modeling of systems with similar components”, *12th International Conference on Applications of Statistics and Probability in Civil Engineering*, Vancouver, Canada.

[8] **Milad Memarzadeh**, Matteo Pozzi, and J. Zico Kolter (2014). “Managing systems made up by similar components: A probabilistic framework for the maintenance of wind farms”, *6th World Conference on Structural Control and Monitoring*, Barcelona, Spain.

[9] **Milad Memarzadeh**, Matteo Pozzi, and J. Zico Kolter (2013). “Probabilistic learning and planning for optimal management of wind farms”, *International Workshop on Structural Health Monitoring*, Stanford University, California.

[10] Carl Malings, **Milad Memarzadeh**, and Matteo Pozzi (2013). “Optimal topology of sensor networks for management of infrastructure systems”, *6th International Conference on Structural Health Monitoring of Intelligent Infrastructure*, Hong Kong.

[11] **Milad Memarzadeh**, Arsalan Heydarian, Mani Golparvar-Fard, and Juan Carlos Niebles (2012). “Real-time and automated 2D recognition and tracking of workers and equipment from site video streams for construction performance assessment”, *ASCE International Conference on Computing in Civil Engineering*, Florida, 429–436.

[12] **Milad Memarzadeh**, and Mani Golparvar-Fard (2012). “Monitoring and visualization of building construction embodied carbon footprint using DnAR, n-dimensional augmented reality models”, *Construction Research Congress*, Purdue University, 1330–1339.

[13] Arsalan Heydarian, **Milad Memarzadeh**, and Mani Golparvar-Fard (2012). “Automated benchmarking and monitoring of earthmoving operation’s carbon footprint using video cameras and GHG estimation model”, *ASCE International Conference on Computing in Civil Engineering*, Florida, 509–516.

#### **Software:**

[1] Tristan Kalos, **Milad Memarzadeh**, and Carl Boettiger (2017). Contpomdp: Approximate POMDP Planning with Continuous State Space, (under construction)

[2] Tristan Kalos, **Milad Memarzadeh**, and Carl Boettiger (2017). despot: Approximate POMDP Planning Software using Adaptive Beliefs Tree, <https://github.com/boettiger-lab/despot>

[3] **Milad Memarzadeh**, and Carl Boettiger (2017). pomdpplus: POMDP Planning and Learning in Uncertain Systems, <https://github.com/boettiger-lab/pomdpplus>

[4] Carl Boettiger, and **Milad Memarzadeh** (2016). mdplearning: Active Learning for MDP, <https://github.com/boettiger-lab/mdplearning>

[5] Jeroen Ooms, Carl Boettiger, and **Milad Memarzadeh** (2016). sarsop: Wrappers in R for the APPL toolkit for approximate POMDP planning, <https://github.com/boettiger-lab/sarsop>

#### **Teaching Experience**

##### **Instructor:**

CE 88 – Data Science for Smart Cities, *University of California Berkeley* Fall 2017  
55 students enrolled, course website: <http://www.miladmemarzadeh.com/ce88.html>

##### **Guest Lectures:**

CE 295 – Energy Systems and Control, *University of California Berkeley* Spring 2016  
Title: Markov Decision Processes and Beyond

12735 – Urban Systems Modeling, *Carnegie Mellon University* Spring 2013-2015  
Title: Bayesian Networks

Transportation Engineering, *University of Tehran*

Spring 2011

Title: Multivariate Regression Analysis

### **Teaching Assistant:**

Urban Systems Modeling, *Carnegie Mellon University*

2013-2015

MATLAB programming, *Carnegie Mellon University*

2013-2015

Probability and Statistics in Civil Engineering, *University of Tehran*

2009-2011

Fortran Programming, *University of Tehran*

2009-2010

Transportation Engineering, *University of Tehran*

2010-2011

### **Grants**

#### **National Science Foundation**

INFEWS/T1: Reducing the Environmental Impacts of FEW Systems In and Around Cities, \$ 2,431,217

Role: Researcher

Investigators: Arpad Horvath, Kara Nelson, and Matthew Potts (UC Berkeley)

#### **LRF/Arup Joint Programme on Resilience Engineering**

Projects as interventions into infrastructure systems, £ 16,231

Role: Co-PI

Investigators: Jennifer Whyte, Arnab Majumdar, and Ben Kidd (Imperial College London), Martin Mayfield (University of Sheffield), Milad Memarzadeh (UC Berkeley)

#### **Pennsylvania Infrastructure Technology Alliance (PITA)**

Probabilistic condition assessment for wind turbine components, \$ 40,000

Role: Researcher

Investigators: Matteo Pozzi and J. Zico Kolter (Carnegie Mellon University)

### **Advising**

Tristan Kalos, *UC Berkeley*

May 2017 - present

Graduate Student Visitor, Department of Environmental Science Policy and Management, UC Berkeley

Tristan worked on developing state-of-the-art software and implementation of the advanced online planning method for solving decision optimization of high-dimensional systems.

## **Professional Service**

### **Conference Organization**

Machine Learning in Science and Engineering, Carnegie Mellon University June 2018  
Track Coordinator, Civil and Environmental Engineering Track

### **Affiliations**

Center for Diversified Farming Systems, UC Berkeley – Research Scientist  
Berkeley Institute for Data Science (BIDS) – Member  
American Society of Civil Engineers (ASCE) – Associate Member  
ASCE Global Center for Excellence in Computing – Member

### **Reviewer**

Automation in Construction  
Journal of Infrastructure Systems  
Journal of Computing in Civil Engineering  
Advanced Engineering Informatics  
Journal of Cleaner Production  
Journal of Advances in Structural Engineering

### **Executive**

CMU Persian Student Organization – *Vice President* 2013-2015

## **Honors and Awards**

Outstanding Reviewer, *Journal of Infrastructure Systems*, 2016  
Outstanding Reviewer, *Journal of Automation in Construction*, 2015  
Finalist of the Three Minutes Thesis Competition, *Carnegie Mellon University* 2015  
Dean's Fellowship, *Carnegie Institute of Technology* 2013  
Identified as an Exceptional Talents , *University of Tehran* 2010  
Champions of Intramural Soccer Tournament, *Carnegie Mellon University* 2013, 2015  
Champions of Bay Area Adult Soccer League 2017, 2018

## **Invited Talks**

[1] Energy, Control and Applications Lab (eCAL), *University of California Berkeley* Oct 2018  
Title: Decision theoretic perspective on infrastructure resilience  
[2] Stanford Urban Resilience Initiative (SURI), *Stanford University* Oct 2018

- Title: Decision theoretic perspective on infrastructure resilience
- [3] Machine Learning in Science and Engineering, *Carnegie Mellon University* June 2018  
 Title: Quantifying resilience of infrastructure systems to extreme events
- [4] International Workshop on Structural Health Monitoring, *Stanford University* Sep 2017  
 Title: Resilience to extreme events: A Bayesian nonparametric approach
- [5] Department of Civil & Environmental Engineering, *Princeton University*, March 2017  
 Title: Engineering resilience of our built and natural environments: A reinforcement learning approach
- [6] Urban Informatics Lab, *Stanford University* Feb 2017  
 Title: Adaptive monitoring and control of the built environment
- [7] Network Dynamics Lab, *Georgia Institute of Technology* Dec 2016  
 Title: Adaptive monitoring and control of complex dynamical systems
- [8] IFIP-WG 7.5, *Carnegie Mellon University* May 2016  
 Title: System-level inspection scheduling using value of information: A fee-based formulation
- [9] Energy, Control and Applications Lab (eCAL), *University of California Berkeley* Jan 2016  
 Title: System-level adaptive monitoring and control of infrastructures: a POMDP-based framework.
- [10] Institute for Complex Engineered Systems, *Carnegie Mellon University* Fall 2015  
 Title: Monitoring and control of complex dynamical and interdependent systems.
- [11] International Workshop on Structural Health Monitoring, *Stanford University* Sep 2015  
 Title: System-level inspection scheduling: an approach based on stochastic future allocation.
- [12] ASCE General Body Meeting, *Carnegie Mellon University* Fall 2014  
 Title: Probabilistic Learning and Planning for Optimal Management of Wind Farms.
- [13] International Workshop on Structural Health Monitoring, *Stanford University* Sep 2013  
 Title: Probabilistic learning and planning for optimal management of wind farms.
- [14] Advanced Infrastructure Systems Seminar, *Carnegie Mellon University* Spring 2013  
 Title: Automated 2D Detection and Localization of Construction Resources in Support of Automated Performance Assessment of Construction Operations.
- [15] ASCE International Conference on Computing in Civil Engineering, *Clearwater, Florida* 2012  
 Title: Real-time and Automated 2D Recognition and Tracking of Workers and Equipment from Site Video Streams for Construction Performance Assessment.  
 Title: Automated Benchmarking and Monitoring of Earthmoving Operation's Carbon Footprint Using Video Cameras and GHG Estimation Model.
- [16] Construction Research Congress, *Purdue University* 2012

Title: Monitoring and visualization of building construction embodied carbon footprint using DnAR, N-dimensional augmented reality models.

## **Media Coverage**

- [1] Three Minute Thesis (3MT) Final, *Carnegie Mellon University Libraries* 2015  
Title: Probabilistic learning and planning framework for optimal management of systems under uncertain environments.  
Link: <https://www.youtube.com/watch?v=bSwMb2TiLzI>
- [2] Civil and Environmental Engineering, *Carnegie Mellon University* 2015  
Title: Sustainably Monitoring Infrastructure Systems: Milad Memarzadeh.  
Link: <https://www.youtube.com/watch?v=SzBdJ73JAsI>
- [3] Civil and Environmental Engineering, *Carnegie Mellon University* 2015  
Title: Restructuring infrastructure: Building smarter systems.  
Link: <https://www.cmu.edu/cee/news/news-archive/2015>
- [4] Civil and Environmental Engineering, *Carnegie Mellon University* 2015  
Title: Assessment process improves wind turbine maintenance.  
Link: <http://www.cmu.edu/cee/news/news-archive/2015>

## **Interests and Activities**

*Music:* classical piano, flute.

*Sports:* Swimming, Football/Soccer

*Non-Scientific Readings:* 20th century existentialism