

# Kamyar Azizzadenesheli

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## Research Interests

My research interest is mainly in the area of Machine Learning, from theory to practice, with the main focus in Reinforcement Learning. I work on Learning Theory, Deep Learning, Robotics, Spectral Method, Non-Convex Optimization, Distributed Optimization, Online Learning, Active Learning, Safety, Adversarial Attacks, and Generative Models.

## Current Positions

**Assistant Professor**, Department of Computer Science  
Purdue University, West Lafayette, IN, USA

*Since August 2020*

## Education

**Ph.D. & M.Sc.** in Electrical Engineering & Computer Science *2014-2019*  
Advised by Prof. Anima Anandkumar, University of California, Irvine, CA, USA.

**B.Sc.** in Electrical Engineering *2010-2014*  
Advised by Prof. F. Ashtiani & Prof. F. Marvasti, Sharif University of Technology, Tehran, Iran.

## Positions

- Assistant Professor at **Purdue University**, West Lafayette, IN, USA. *(August 2020-Present)*
- Postdoctoral Scholar at **Caltech**, Pasadena, CA, USA. *(July 2019-August 2020)*  
*Hosts: Prof. Animashree Anandkumar & Prof. Yisong Yue*
- Special Student at **Caltech**, Pasadena, CA, USA. *(April 2019-June 2019)*  
*Hosts: Prof. Animashree Anandkumar & Prof. Yisong Yue*
- Visiting Researcher at **Caltech**, Pasadena, CA, USA. *(June 2018-April 2019)*  
*Hosts: Prof. Animashree Anandkumar & Prof. Yisong Yue*
- Visiting Researcher at **Stanford University**, Palo Alto, CA, USA. *(October 2017-June 2018)*  
*Hosts: Prof. Emma Brunskill*
- Long term visiting researcher at **Simons Institute**, UC Berkeley, CA. *(Jan 2017-May 2017)*
- Guest Researcher at **INRIA**, France. *(August 2016-November 2016)*  
*Hosts: Dr. Alessandro Lazaric*
- Short-term Visiting Researcher at **MSR**, New York City, NY, USA. *(2016)*
- Short-term Visiting Researcher at **MSR**, New England, MA, USA. *(2016)*

## Awards and Honors

- **EECS Department Fellowship**, University of California, Irvine, CA, USA, 2014.
- **Silver Medal** in International Olympiad in Astronomy & Astrophysics, Beijing, China, 2010.
- **Gold Medal** in National Olympiad in Astronomy & Astrophysics, Tehran, Iran, 2009.
- **First rank elite student** in National Elite Foundation, Iran, 2009-2014.
- **Second prize** in Sharif RoboCup Competition, Machine vision section, Tehran, Iran, 2012.

## Books

- **Deep Learning - The Straight Dope**, an online Deep Learning book on Amazon Mxnet Library. Zachary C. Lipton, Mu Li, Alex Smola, Sheng Zha, Aston Zhang, Joshua Z. Zhang, Eric Junyuan Xie, K. Azizzadenesheli, Jean Kossaifi, Stephan Rabanser, [\[link\]](#)

## Papers

- \* Audrey Huang, Liu Leqi, Zachary C. Lipton, Kamyar Azizzadenesheli. On the Convergence and Optimality of Policy Gradient for Coherent Risk , 2021  
[\[paper\]](#)
- \* Mridul Agarwal, Vaneet Aggarwal, Kamyar Azizzadenesheli. Multi-Agent Multi-Armed Bandits with Limited Communication, 2021  
[\[paper\]](#)
- \* K. Kashinath, M. Mustafa, A. Albert, J-L. Wu, C. Jiang, S. Esmailzadeh, Kamyar. Azizzadenesheli, R. Wang, A. Chattopadhyay, A. Singh, A. Manepalli, D. Chirila, R. Yu, R. Walters, B. White, H. Xiao, H. A. Tchelepi, P. Marcus, A. Anandkumar, P. Hassanzadeh and Prabhat. Physics-informed machine learning: case studies for weather and climate modelling, *Appeared at The Royal Society, 2021.*  
[\[paper\]](#)
- \* Burigede Liu, Nikola Kovachki, Zongyi Li, K. Azizzadenesheli, Anima Anandkumar, Andrew Stuart, Kaushik Bhattacharya. A learning-based multiscale method and its application to inelastic impact problems,  
[\[paper\]](#)
- \* Jonathan D. Smith, Zachary E. Ross, K. Azizzadenesheli, Jack B. Muir. HypoSVI: Hypocenter inversion with Stein variational inference and Physics Informed Neural Networks.  
[\[paper\]](#)
- \* Kamyar Azizzadenesheli. Importance Weight Estimation and Generalization in Domain Adaptation under Label Shift.  
[\[paper\]](#)
- \* Soheil Esmailzadeh, Chiyu Max Jiang, Kamyar Azizzadenesheli, Karthik Kashinath, Mustafa Mustafa, Hamdi A Tchelepi, Philip Marcus, Mr Prabhat, Anima Anandkumar. A Deep Learning Based Physics Informed Continuous Spatio Temporal Super-Resolution Framework. *Bulletin of the American Physical Society, 2020.*  
[\[paper\]](#)
- \* Zongyi Li, Nikola Kovachki, K. Azizzadenesheli, Burigede Liu, Kaushik Bhattacharya, Andrew Stuart, Anima Anandkumar. Fourier Neural Operator for Parametric Partial Differential Equations, *Appeared at International Conference on Learning Representations (ICLR) 2021.*  
[\[paper\]](#) [\[Code\]](#) [\[Blog Post\]](#)

- \* Sahin Lale, Kamyar Azizzadenesheli, Babak Hassibi, Anima Anandkumar. Explore More and Improve Regret in Linear Quadratic Regulators, 2020.  
[paper]
- \* Akella Ravi Tej, Kamyar Azizzadenesheli, Mohammad Ghavamzadeh, Yisong Yue, Anima Anandkumar. Deep Bayesian Quadrature Policy Optimization. *Appeared at AAAI Conference on Artificial Intelligence 2021 (AAAI-21)*.  
[paper] [Code]
- \* Manish Prajapat, Kamyar Azizzadenesheli, Alexander Liniger, Yisong Yue, Anima Anandkumar. Competitive Policy Optimization, 2020.  
[paper] [Code] [Package] [Page] [Blog]
- \* Zongyi Li, Nikola Kovachki, Kamyar Azizzadenesheli, Burigede Liu, Kaushik Bhattacharya, Andrew Stuart, Anima Anandkumar. Multipole Graph Neural Operator for Parametric Partial Differential Equations, 2020. *Appeared at Neural Information Processing Systems (NeurIPS) 2020*.  
[paper] [Code]
- \* Kamyar Azizzadenesheli, Yisong Yue, Animashree Anandkumar. Policy Gradient in Partially Observable Environments: Approximation and Convergence, 2020.  
[paper]
- \* Chiyu (Max) Jiang, Soheil Esmailzadeh, Kamyar Azizzadenesheli, Karthik Kashinath, Mustafa Mustafa, Hamdi A. Tchelepi, Philip Marcus, Prabhat, Anima Anandkumar. MeshfreeFlowNet: A Physics-Constrained Deep Continuous Space-Time Super-Resolution Framework. *Appeared at SC20, The International Conference for High Performance Computing, Networking, Storage, and Analysis. Best Paper Finalist*.  
[paper] [Package] [Talk] [Page]
- \* Jonathan D. Smith, K. Azizzadenesheli, Zachary E. Ross. EikoNet: Solving the Eikonal equation with Deep Neural Networks, 2020.  
*Appeared IEEE Transactions on Geoscience and Remote Sensing*.  
[paper] [Code] [Colab]
- \* Sahin Lale, K. Azizzadenesheli, Babak Hassibi, Animashree Anandkumar. Logarithmic Regret Bound in Partially Observable Linear Dynamical Systems, 2020.  
*Appeared at Neural Information Processing Systems (NeurIPS) 2020*.  
[paper]
- \* Sahin Lale, K. Azizzadenesheli, Babak Hassibi, Animashree Anandkumar. Adaptive Control and Regret Minimization in Linear Quadratic Gaussian (LQG) Setting, 2021.  
*Appeared at American Control Conference ACC 2021*.  
[paper]
- \* Zongyi Li, Nikola Kovachki, K. Azizzadenesheli, Burigede Liu, Kaushik Bhattacharya, Andrew Stuart, Anima Anandkumar. Neural Operator: Graph Kernel Network for Partial Differential Equations, *Appeared at International Conference on Learning Representations (ICLR) 2020 Workshop*.  
[paper] [Code] [Blog Post]
- \* Sahin Lale, K. Azizzadenesheli, Babak Hassibi, Animashree Anandkumar. Regret Minimization in Partially Observable Linear Quadratic Control, *Appeared at Neural Information Processing Systems (NeurIPS) 2019 Workshop*.  
[paper]
- \* Zachary E Ross, Daniel T Trugman, K. Azizzadenesheli, Animashree Anandkumar. Directivity Modes of Earthquake Populations with Unsupervised Learning, *Appeared at the Journal of Geophysical Research 2020*,  
[paper]

- \* Amy Zhang, Zachary C Lipton, Luis Pineda, K. Azizzadenesheli, Animashree Anandkumar, Laurent Itti, Joelle Pineau, Tommaso Furlanello. Learning Causal State Representations of Partially Observable Environments,  
*Appeared at the Multi-disciplinary Conference on Reinforcement Learning and Decision Making (RLDM) 2019.*  
[paper]
- \* K. Azizzadenesheli. Maybe a few considerations in Reinforcement Learning Research?, 2019.  
[paper]
- \* K. Azizzadenesheli. Reinforcement Learning in Structured and Partially Observable Environments, 2019.  
[Thesis]
- \* K. Azizzadenesheli, Manish Kumar Bera, Animashree Anandkumar. Trust Region Policy Optimization of POMDPs, 2018.  
[paper]
- \* Sahin Lale, K. Azizzadenesheli, Babak Hassibi, Animashree Anandkumar. Stochastic Linear Bandits with Hidden Low Rank Structure,  
*Appeared at Neural Information Processing Systems (NeurIPS) 2019 Workshop.*  
[paper]
- \* K. Azizzadenesheli, Anqi Liu, Fanny Yang, Animashree Anandkumar. Regularized Learning for Domain Adaptation under Label Shifts,  
*Appeared at International Conference on Learning Representations (ICLR) 2019.*  
[paper]
- \* Jeremy Bernstein, Jiawei Zhao, K. Azizzadenesheli, Anima Anandkumar. signSGD with Majority Vote is Communication Efficient and Fault Tolerant,  
*Appeared at International Conference on Learning Representations (ICLR) 2019.*  
[paper]
- \* Guanya Shi, Xichen Shi, Michael O’Connell<sup>1</sup>, Rose Yu, K. Azizzadenesheli, Animashree Anandkumar, Yisong Yue, and Soon-Jo Chung. Neural Lander: Stable Drone Landing Control using Learned Dynamics,  
*Appeared at International Conference on Robotics and Automation (ICRA) 2019.*  
[paper] [video]
- \* K. Azizzadenesheli, Brandon Yang, Weitang Liu, Zachary C Lipton, Animashree Anandkumar. Surprising Negative Results for Generative Adversarial Tree Search,  
*Appeared at International Conference on Machine Learning (ICML) 2018 workshop.*  
[paper]
- \* Jeremy Bernstein, Yu-Xiang Wang, K. Azizzadenesheli, Anima Anandkumar. signSGD: Compressed Optimisation for Non-Convex Problems,  
*Appeared at International Conference on Machine Learning (ICML) 2018.*  
[paper]
- \* Jeremy Bernstein, K. Azizzadenesheli, Yu-Xiang Wang, Anima Anandkumar. Compression by the signs: distributed learning is a two-way street,  
*Appeared at International Conference on Learning Representations (ICLR) 2018 Workshop.*  
[paper]
- \* Guneet S. Dhillon, K. Azizzadenesheli, Jeremy D. Bernstein, Jean Kossaifi, Aran Khanna, Zachary C. Lipton, Animashree Anandkumar. Stochastic activation pruning for robust adversarial defense,  
*Appeared at International Conference on Learning Representations (ICLR) 2017.*  
[paper]

- \* K. Azizzadenesheli, Animashree Anandkumar. Efficient Exploration through Bayesian Deep Q-Networks, *Appeared at Neural Information Processing Systems (NeurIPS) 2017 Workshop*.  
[paper] [talk]
- \* K. Azizzadenesheli, Alessandro Lazaric, Anima Anandkumar. Reinforcement Learning in Rich Observation MDPs using Spectral Methods, *Appeared at Multi-disciplinary Conference on Reinforcement Learning and Decision Making (RLDM) 2017*.  
[paper]
- \* Zachary C. Lipton, K. Azizzadenesheli, Abhishek Kumar, Lihong Li, Jianfeng Gao, Li Deng. Combating Reinforcement Learning’s Sisyphean Curse with Intrinsic Fear, *Appeared at Neural Information Processing Systems (NeurIPS) 2016 Workshop*.  
[paper]
- \* K. Azizzadenesheli, Alessandro Lazaric, Anima Anandkumar. Experimental paper: Reinforcement Learning of POMDPs using Spectral Methods, *Appeared at Neural Information Processing Systems (NeurIPS) 2016 Workshop*.  
[paper]
- \* K. Azizzadenesheli, Alessandro Lazaric, Anima Anandkumar. Open Problem: Approximate Planning of POMDPs in the class of Memoryless Policies, *Appeared at Conference on Learning Theory (COLT) 2016*.  
[paper] [talk]
- \* K. Azizzadenesheli, Alessandro Lazaric, Anima Anandkumar. Reinforcement Learning of POMDPs using Spectral Methods, *Appeared at Conference on Learning Theory (COLT) 2016*.  
[paper] [talk]

## News

- Podcast interview by TalkRL (*October, 2019*)
- Talk on Statistical Learning Theory in Practice, UC. San Diego, CA, USA (*March, 2019*)
- Talk Reinforcement Learning in Structured Environments, UT Austin, Tx, USA (*October, 2018*)
- Interview by This Week in Machine Learning AI (TWiML & AI) (*August, 2018*)
- Talk on Exploration in Reinforcement Learning workshop, ICML 2018, Stockholm, Sweden (*July, 2018*)
- Talk on Bayesian deep Reinforcement Learning , Stanford, CA, USA (*May, 2018*)
- Talk on Reinforcement Learning in rich observable environment , Stanford, CA, USA (*February, 2018*)
- Talk at MLTrainon workshop, NeurIPS 2017, Long Beach, CA, USA (*December, 2017*)
- Talk on Deep Learning, Deep RL and MxNet at Stanford University, CA, USA (*November, 2017*)
- Invited talk at Amazon AWS, Palo Alto, CA, USA (*April, 2017*)
- Talk at ”Interactive Learning” workshop, Simons Institute, UC Berkeley, CA, USA (*Feb, 2017*)
- Talk on ”RL of Partially Observable Environment” Caltech, CA, USA (*Jan, 2017*)
- Talk at ”Open Problem” , *Colombia University, (COLT), (June, 2016)*
- Talk at ”Bandit and Reinforcement Learning”, *Colombia University, (COLT), (June, 2016)*
- Certified in ”Topological Data Analysis” *NSF-CBMS, (June, 2016)*

## Mentees

Guneet S Dhillon (UT Austin, Amazon), Weitang Liu (UC, Davis), Jeremy Bernstein (Caltech), Sahin Lale (Caltech), Brandon Yang (Stanford, Google Brain), Manish Kumar Bera (IIT Kanpur, Caltech), Jiawei Zhao (Nanjing University, Caltech), Hongjie Chen (Shanghai Jiao Tong University, Caltech), Zongyi Li (Washington University in St. Louis, Caltech), Vivek Bharadwaj (Caltech), Akshay R. Vegesna (Caltech), Ravi Tej Akella (IIT Roorkee), Manish Prajapat (ETH), Albert Zhai (Caltech), Abhijeet Vyas (IIT), Jihwan Bae (Gwangju Institute of Science and Technology), Sirui Li (MIT), Saturnin J. Pugnet (Caltech)

### Professional Services:

Reviewer: JMLR, ACM SIGMETRICS, IJCLA, AAAI, COLT, ICLR, ICML, LOD, NeurIPS, RLDM, IEEE, Springer STCO