

Bo Liu

Assitant Professor, Auburn University
URL: www.eng.auburn.edu/~bzl0056/

Phone: 551-333-9638
Email: boliu@auburn.edu

EDUCATION

2010 -2015 **Ph.D.** Computer Science, University of Massachusetts Amherst
Advisor: Sridhar Mahadevan
2008 -2010 **M.S.** Computer Engineering, Stevens Institute of Technology
2005 -2008 **M.S.** Control Engineering, University of Science and Technology of China

INDUSTRY EXPERIENCE

07/2016 - present	Assistant Professor	Auburn University, Auburn, AL
09/2015 - 04/2016	Research Staff Member	Philips Research, Cambridge, MA
06/2015 - 08/2015	Research Scientist Intern	Amazon Research, Seattle, WA
06/2013 - 09/2013	Machine Learning Scientist Intern	Amazon Research, Seattle, WA
06/2011 - 09/2011	Applied Research Intern	eBay Search Science, San Jose, CA

HONORS AND AWARDS

2017 Tencent Rhino-Bird Award, Tencent AI Lab
2016 ACM Doctoral Dissertation Award Nomination, by UMass Amherst
2015 Facebook Best Student Paper Award of UAI-2015
2013 Google Fellowship Nomination, by UMass Amherst
2012 NIPS Student Award
2012 UAI Student Scholarship
2010 ICNSC Doctoral Consortium Grant
2009 ICCNS Student Fellowship

RESEARCH INTEREST

Interactive Machine Learning

Reinforcement learning, Active learning, Online learning, and multi-armed bandit with application to online recommendation and spoken dialog system

Deep Learning

Deep Neural Networks theory, design, and applications

Large-Scale Efficient Optimization

Online/stochastic optimization with application to time-series problems including demand forecasting and transaction risk management

Transfer Learning

Multi-task learning and domain adaptation with application to multi-lingual machine translation and social network analysis

SELECTED PUBLICATIONS

My Google Scholar ([Students advised in blue](#))

Stats: NIPS(3), JAIR(1), IEEE-TNN(3), UAI(3), IJCAI(2), AAAI(2), ACM-TECS(1)

Topics: Machine learning, Computer vision, Robotics, Optimization.

Conference Publications

- C1 Daoming Lyu, Fangkai Yang, **Bo Liu**, Steven Gustafson. SDRL: Interpretable and Data-efficient Deep Reinforcement Learning Leveraging Symbolic Planning. *Thirty-Third AAAI Conference on Artificial Intelligence*, Honolulu, HI, 2019.
Acceptance rate: 16.2%(1150/7095).
- C2 **Bo Liu***, Tengyang Xie* (* equal contribution), Yangyang Xu, Mohammad Ghavamzadeh, Yinlam Chow, Daoming Lyu, Daesub Yoon. A Block Coordinate Ascent Algorithm for Mean-Variance Optimization. *32nd Conference on Neural Information Processing Systems (NIPS)*, Montreal, Canada, 2018.
Acceptance rate: 20%(1011/4856).
- C3 Fangkai Yang, Steven Gustafson, Alexander Elkholy, Daoming Lyu and **Bo Liu**. Program Search for Machine Learning Pipelines: Leveraging Symbolic Planning and Reinforcement Learning. *Genetic Programming Theory & Practice XVI*, Ann Arbor, MI, 2018.
- C4 Fangkai Yang, Daoming Lyu, **Bo Liu**, Steve Gustafson. PEORL: Integrating Symbolic Planning and Hierarchical Reinforcement Learning for Robust Decision-Making. *International Joint Conferences on Artificial Intelligence (IJCAI)*, 2018. **press coverage**
Acceptance rate: 20%(710/3470).
- C5 Hasan, S. A., **Bo Liu**, Liu, J., et.al. Neural Clinical Paraphrase Generation with Attention. *ClinicalNLP 2016*.
- C6 **Bo Liu**, Ji Liu, Luwan Zhang. Dantzig Selector with an Approximately Optimal Denoising Matrix. *Proceedings of the Conference on Uncertainty in AI (UAI)*, 2016.
Acceptance rate: 31%(85/275).
- C7 **Bo Liu**, Ji Liu, Mohammad Ghavamzadeh, Sridhar Mahadevan, Marek Petrik. A Proximal Gradient Framework for Robust TD Learning. *International Joint Conferences on Artificial Intelligence (IJCAI)*, 2016.
Acceptance rate: 24%(551/2294).
- C8 Deguang Kong, Ji Liu, **Bo Liu**, Xuan Bao. Uncorrelated Group Lasso. *Association for the Advancement of Artificial Intelligence (AAAI)*, 2016.
Acceptance rate: 26%(549/2132).
- C9 **Bo Liu**, Ji Liu, Mohammad Ghavamzadeh, Sridhar Mahadevan, Marek Petrik. Finite-Sample Analysis of Proximal Gradient Algorithms. *Proceedings of the Conference on Uncertainty in AI (UAI)*, 2015, **Facebook Best Student Paper Award**.
Acceptance rate: 1%(3/291) (Best paper award rate).
- C10 **Bo Liu**, Sridhar Mahadevan, Ji Liu. Regularized Off-Policy TD-Learning. *26th Annual Conference on Neural Information Processing Systems (NIPS)*, Lake Tahoe, Nevada, 2012, December 3-6, **Spotlight presentation**.
Acceptance rate: 4%(72/1467) (Oral presentation rate).
- C11 Sridhar Mahadevan, **Bo Liu**. Sparse Q-learning with Mirror Descent. *Proceedings of the Conference on Uncertainty in AI (UAI)*, 2012.
Acceptance rate: 31%(95/304).
- C12 Sridhar Mahadevan, **Bo Liu**. Basis Construction from Power Series Expansions of Value Functions. *24th Annual Conference on Neural Information Processing Systems (NIPS)*, Vancouver, B.C., Canada, 2010, December 6-8.
Acceptance rate: 24%(293/1219).
- C13 Haibo He, **Bo Liu**. A Hierarchical Learning Architecture with Multiple-Goal Representations Based on Adaptive Dynamic Programming *IEEE International Conference on Networking, Sensing and Control (ICNSC'10)*, Chicago, 2010.

- C14 **Bo Liu**, Haibo He, Daniel.Repperger. Two-Time-Scale Online Actor-Critic Paradigm Driven by POMDP. *IEEE International Conference on Networking, Sensing and Control (ICNSC'10)*, Chicago, 2010.
- C15 **Bo Liu**, Haibo He, Sheng Chen. A Dual-System Learning and Control Method for Machine Intelligence. *Proc. Int. Conf. on Cognitive and Neural Systems (ICNS'09)*, Boston, May 27-30, 2009.

Journal Publications

- J1 Shuying Li, Zhanwen Liu, Tao GAO, Fanjie Kong, Ziheng Jiao, Aodong Yang, **Bo Liu**. A Novel Restoration Algorithm for Noisy Complex Illumination. *IET Computer Vision*.
Impact factor: 1.132.
- J2 **Bo Liu**, Ian Gemp, Mohammad Ghavamzadeh, Ji Liu, Sridhar Mahadevan, Marek Petrik. Proximal Gradient Temporal Difference Learning: Stable Reinforcement Learning with Polynomial Sample Complexity. *Journal of Artificial Intelligence Research (JAIR)*, 2018.
Impact factor: 8.78.
- J3 [Daoming Lyu](#), **Bo Liu**, Matthieu Geist, Wen Dong, Saad Biaz, and Qi Wang. Stable and Efficient Policy Evaluation *IEEE Transactions on Neural Networks and Learning Systems (IEEE TNN)*, 2018.
Impact factor: 4.854.
- J4 Wang, Q.; Wan, J.; Nie, F.; **Bo Liu**; Young, C.; Li, X Hierarchical Feature Selection for Random Projection. *IEEE Transactions on Neural Networks and Learning Systems (IEEE TNN)*, 2018.
Impact factor: 4.854.
IEEE Transactions on Neural Networks and Learning Systems (IEEE TNN)
- J5 Ai-Wen Jiang, **Bo Liu**, Ming-Wen Wang. Deep Multimodal Reinforcement Network with Contextually Guided Recurrent Attention for Image Question Answering *Journal of Computer Science and Technology*, 32(4), 738-748, 2017.
Impact factor: 0.956.
- J6 Shuai Li, Yuesheng Lou, **Bo Liu**. Bluetooth aided mobile phone localization: a nonlinear neural circuit approach. *ACM Transactions on Embedded Computing Systems (ACM TECS)*, 2014.
Impact factor: 1.190.
- J7 Shuai Li, **Bo Liu**, Yangming Li. Selective Positive-negative Feedback Produces the Winner-take-all Competition in Recurrent Neural Networks. *IEEE Transactions on Neural Networks and Learning Systems (IEEE TNN)*, 2013.
Impact factor: 4.854.
- J8 Shuai Li, Sanfeng Chen, **Bo Liu**, Yangming Li, Yongsheng Liang Decentralized Kinematic Control of A Class of Collaborative Redundant Manipulators via Recurrent Neural Networks, *Neurocomputing*, 2012.
Impact factor: 2471.
- J9 Shuai Li, Sanfeng Chen, **Bo Liu**. Accelerating a Recurrent Neural Network to Finite-Time Convergence for Solving Time-Varying Sylvester Equation by Using a Sign-Bi-power Activation Function, *Neural Processing Letters*, pp.1-17, 2012
Impact factor: 1.747.

- J10 Shuai Li, **Bo Liu**, Baogang Chen and Yuesheng Lou. Neural Network Based Mobile Phone Localization Using Bluetooth Connectivity. *Neural Computing and Applications*, 2012.
Impact factor: 1.569.
- J11 Shuai Li, Hongzhu Cui, Yangming Li, **Bo Liu** and Yuesheng Lou. Decentralized Control of Collaborative Redundant Manipulators with Partial Command Coverage via Locally Connected Recurrent Neural Networks. *Neural Computing and Applications*, 2012.
Impact factor: 1.569.
- J12 Shuai Li, Yunpeng Wang, Jiguo Yu, **Bo Liu**. A Nonlinear Model to Generate the Winner-take-all Competition. *Communications in Nonlinear Science and Numerical Simulation*, 2012.
Impact factor: 2.866.
- J13 **Bo Liu**, Sanfeng Chen, Shuai Li, Yongsheng Liang Intelligent control of a sensor-actuator system via kernelized least-squares policy iteration. *Sensors* 12 (3), 2632-2653, 2012.
Impact factor: 2.437.
- J14 Sanfeng Chen, Shuai Li, **Bo Liu**, Yuesheng Lou and Yongsheng Liang, Self-Learning Variable Structure Control for a Class of Sensor-Actuator Systems, *Sensors*, Vol.12, pp.6117-6128, 2012.
Impact factor: 2.437.
- J15 **Bo Liu**, Haibo He, Sheng Chen. Adaptive Dual Network Design for a Class of SIMO Systems with Nonlinear Time-variant Uncertainties. *Acta Automatica Sinica*, Vol.36, pp.564-572, 2010.
Impact factor: 1.290.

Workshop and other publications

- W1 **Bo Liu**, Ji Liu, Kenan Xiao. R²PG: Risk-Sensitive and Reliable Policy Gradient. *32nd AAAI Conference on Artificial Intelligence workshop on planning and inference*, New Orleans, LA, 2018.
- W2 Ian Gemp, Sridhar Mahadevan, **Bo Liu**. Solving Large-Scale Sustainable Supply Chain Networks using Variational Inequalities, *AAAI Workshop on Computational Sustainability*, Austin, Texas, 2015.

INVITED TALKS

- Efficient Mean-Variance Optimization, Rensselaer Polytechnic Institute, November, 2018
- Efficient Mean-Variance Optimization, University of Alberta, July, 2018
- Symbolic Deep Reinforcement Learning, RBC Borealis AI, June, 2018
- Symbolic Deep Reinforcement Learning, University of Alberta, June, 2018
- Duality in TD learning and risk control, Huawei (Futurewei) RLAD Lab, Edmonton, May, 2018
- Gradient, Semi-gradient and Pseudo-gradient Reinforcement Learning, SIAM Conference on Optimization, Vancouver, July, 2017
- Proximal Reinforcement Learning. SUNY Buffalo, Buffalo, NY, 2016
- Proximal Reinforcement Learning. Auburn University, AL, 2016
- Proximal Reinforcement Learning. Washington State University, Pullman, WA, 2015
- Efficient Transfer Decision-making. Amazon Research, Seattle, WA, 2015
- Efficient Transfer Decision-making. Philips Research, Briarcliff, NY, 2015
- Sequential Decision Making Meets Big Data. Washington State University, Pullman, WA, 2013
- First-Order Sparse Reinforcement Learning. Adobe Research, CA, 2012

ACADEMIC SERVICES

Associate Editor:

IEEE Geoscience and Remote Sensing Letters, ACM Transactions on Interactive Intelligent Systems (Program committee member)

Proposal Panel Review:

NSF IIS Career on Smart and Connected Health, 2016

NSF IIS Core, 2018

Journal Review:

Machine Learning (MLJ), Artificial Intelligence (AIJ), IEEE Transactions on Neural Networks and Learning Systems (TNN), IEEE Signal Processing Letters, IEEE Transactions on Circuits and Systems for Video Technology (TCSVT), IEEE Transactions on Transactions on Autonomous Mental Development (TAMD), IET Image Processing, ACM Transactions on Interactive Intelligent Systems, Neurocomputing, Knowledge-Based Systems, Applied Soft Computing, Artificial Intelligence Review, Evolving Systems, Expert Systems with Applications, Journal of Classification, Pattern Analysis and Applications

Conference Review:

UbiComp 2015. AAAI 2016-present. IJCAI 2015-present. NIPS 2013-present. AISTATS 2017-present. ICLR 2018. COLING 2018. COLT 2018

Program Committee:

AAAI 2017. IJCAI 2015, 2016, 2018.