Bin Hu

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Academic Appointments

University of Illinois at Urbana-Champaign **Urbana, IL**
Assistant Professor, Department of Electrical and Computer Engineering *August 2018–Present*

University of Wisconsin-Madison **Madison, WI**
Postdoctoral Associate, Wisconsin Institute for Discovery *July 2016–July 2018*
Supervisor: Laurent Lessard

Research Interests

Machine learning, robust control, stochastic optimization

Education

University of Minnesota, Twin Cities **Minneapolis, MN**
Ph.D. in Aerospace Engineering and Mechanics *2010–2016*
Advisor: Peter Seiler

- Minor: Statistics
- Dissertation: A Robust Control Perspective on Optimization of Strongly-Convex Functions

Carnegie Mellon University **Pittsburgh, PA**
M.S. in Computational Mechanics *2009–2010*

University of Science and Technology of China **Hefei, Anhui**
B.S. in Theoretical and Applied Mechanics *2004–2008*

Publications

1. **B. Hu**, P. Seiler, and L. Lessard. Analysis of biased stochastic gradient descent using sequential semidefinite programs. To appear in *Mathematical Programming*, 2020.
2. J. Jansch-Porto, **B. Hu**, and G. Dullerud. Convergence guarantees of policy optimization methods for Markovian jump linear systems. To appear in *American Control Conference (ACC)*, 2020.
3. H. Xiong, Y. Chi, **B. Hu**, and W. Zhang. Analytical convergence regions of accelerated gradient descent in nonconvex optimization under regularity condition. To appear in *Automatica*, 2020.
4. K. Zhang, **B. Hu**, and T. Başar. Policy optimization for $\mathcal{H}_2$ Linear Control with $\mathcal{H}_\infty$ robustness guarantee: Implicit regularization and global convergence. *arXiv:1910.09496*, 2019. (preprint)
5. **B. Hu** and U. Syed. Characterizing the exact behaviors of temporal difference learning algorithms using Markovian jump linear system theory. In *Advances in Neural Information Processing Systems (NeurIPS)*, pp. 8477-8488, 2019.
6. D. Ding, **B. Hu**, N. Dhingra, and M. Jovanovic. An exponentially convergent primal-dual algorithm for nonsmooth composite minimization. In *Conference on Decision and Control (CDC)*, pp.4927-4932, 2018.

7. **B. Hu**, S. Wright, and L. Lessard. Dissipativity theory for accelerating stochastic variance reduction: A unified analysis of SVRG and Katyusha using semidefinite programs. In *International Conference on Machine Learning (ICML)*, PMLR 80: pp.2038-2047, 2018.
8. S. Cyrus, **B. Hu**, B. Van Scoy, and L. Lessard. A robust accelerated optimization algorithm for strongly convex functions. In *American Control Conference (ACC)*, pp. 1376-1381, 2018.
9. A. Sundararajan, **B. Hu**, and L. Lessard. Robust convergence analysis of distributed optimization algorithms. In *Allerton Conference on Communication, Control, and Computing*, pp. 1206-1212, 2017.
10. **B. Hu** and L. Lessard. Dissipativity theory for Nesterov's accelerated method. In *International Conference on Machine Learning (ICML)*, PMLR 70: pp.1549-1557, 2017.
11. **B. Hu**, P. Seiler, and A. Rantzer. A unified analysis of stochastic optimization methods using jump system theory and quadratic constraints. In *Conference on Learning Theory (COLT)*, PMLR 65: pp.1157-1189, 2017.
12. **B. Hu** and L. Lessard. Control interpretations for first-order optimization methods. In *American Control Conference (ACC)*, pp.3114-3119, 2017.
13. **B. Hu**, M. J. Lacerda, and P. Seiler. Robustness analysis of uncertain discrete-time systems with dissipation inequalities and integral quadratic constraints. *International Journal of Robust and Nonlinear Control*, 27(11), pp.1940-1962, 2017.
14. **B. Hu** and P. Seiler. Exponential decay rate conditions for uncertain linear systems using integral quadratic constraints. *IEEE Transactions on Automatic Control*, 61(11), pp.3631-3637, 2016.
15. **B. Hu** and S.Z. Khong. Robust consensus in multi-agent networked systems with nonlinear or time-varying Uncertainties. In *22nd International Symposium on Mathematical Theory of Networks and Systems (MTNS)*, 2016.
16. **B. Hu** and P. Seiler. Pivotal decomposition for reliability analysis of fault tolerant control systems on unmanned aerial vehicles. *Reliability Engineering & System Safety*, 140, pp.130-141, 2015.
17. **B. Hu** and P. Seiler. A probabilistic method for certification of analytically redundant systems. *International Journal of Applied Mathematics and Computer Science*, 25(1), pp.103-116, 2015.
18. F. A. Lie, H. Mokhtarzadeh, P. Freeman, J. Larson, T. Layh, **B. Hu**, B. Taylor, D. Gebre-Egziabher, P. Seiler, and G. Balas. An airborne experimental test platform: From theory to flight (part 2). In *InsideGNSS*, pp.40-47, May/June 2014
19. **B. Hu** and P. Seiler. Worst-case false alarm analysis of aerospace fault detection systems, In *American Control Conference (ACC)*, pp.654-659, 2014.
20. **B. Hu** and P. Seiler. Certification analysis for a model-based UAV fault detection system. In *AIAA Guidance, Navigation and Control Conference*, AIAA-2014-0610, 2014.
21. **B. Hu** and P. Seiler. Probability bounds for false alarm analysis of fault detection systems. In *Allerton Conference on Communication, Control, and Computing*, pp.989-995, 2013.
22. **B. Hu** and P. Seiler. A probabilistic method for certification of analytically redundant systems. In *International Conference on Control and Fault-Tolerant Systems (SysTol)*, pp.13-18, 2013.

Invited Talks (Excluding Conference Presentations)

1. Rutgers University, ECE seminar, Mar. 22, 2018

2. Cornell University, ECE-ISN Seminar, Oct. 27, 2017.
3. UC Irvine, System & Control Seminar, Oct. 17, 2017.
4. University of Southern California, CSC Seminar, Oct. 16, 2017.
5. UIUC, SINE Seminar, Oct. 9, 2017.
6. UW-Madison, SILO Seminar, Mar. 2, 2016.

Teaching Experience

University of Illinois at Urbana-Champaign **Urbana, IL**
Instructor, Department of Electrical and Computer Engineering *2018-Present*

- ECE 586RL (Spring 2020): Markov Decision Processes and Reinforcement Learning
- ECE 598ICM (Spring 2019): Interplay between Control and Machine Learning
- ECE 490 (Fall 2018): Introduction to Optimization

University of Minnesota, Twin Cities **Minneapolis, MN**
Graduate Teaching Assistant, Department of Aerospace Engineering and Mechanics *2011*

- AEM 8201: Fluid Mechanics I
- AEM 5253: Computational Fluid Mechanics
- AEM 4203: Aerospace Propulsion
- AEM 2011: Statics

Awards and Honors

- Departmental Scholarship, Dept. of Civil and Environmental Engineering, Carnegie Mellon University
- Outstanding Student Scholarship, Dept. of Modern Mechanics, University of Science and Technology of China

Service

Invited Referee for Journals and Conferences

- *IEEE Transactions on Automatic Control*
- *IEEE Transactions on Control of Networked Systems*
- *Automatica*
- *IEEE Control Systems Letters*
- *Mathematical Programming*
- *SIAM Journal on Optimization*
- *SIAM Journal on Control and Optimization*
- *Advances in Neural Information Processing Systems (NeurIPS)*
- *International Conference on Machine Learning (ICML)*
- *Conference on Learning Theory (COLT)*
- *International Conference on Learning Representations (ICLR)*
- *AAAI Conference on Artificial Intelligence (AAAI)*
- *International Conference on Artificial Intelligence and Statistics (AIStats)*
- *Conference on Uncertainty in Artificial Intelligence (UAI)*

- *International Journal of Robust and Nonlinear Control*
- *International Journal of Control*
- *International Journal of Applied Mathematics and Computer Science*
- *Simulation Modelling Practice and Theory*
- *Nonlinear Dynamics*
- *Conference on Decision and Control (CDC)*
- *American Control Conference (ACC)*
- *European Control Conference (ECC)*
- *International Conference on Control and Fault Tolerant Systems (SysTol)*

Workshop organizer

- *Workshop on Interplay between Control, Optimization, and Machine Learning, 2019 American Control Conference*