

ALEC KOPPEL

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RESEARCH INTERESTS	Applications of stochastic optimization to develop new learning methods, both for statistical inference and autonomous control. Topics of interest include: centralized and decentralized convex optimization, memory-efficient kernel methods, supervised and reinforcement learning, collaboration in robotic teams, networked control systems, adaptive signal processing, online machine learning, and mathematical statistics.
EMPLOYMENT	<p>U.S. Army Research Laboratory Adelphi, MD Research Scientist August 2017 - Present <i>Computational and Information Sciences Directorate</i></p> <p>University of Pennsylvania Philadelphia, PA Research Assistant August 2012 - August 2017 <i>Electrical and Systems Engineering</i></p> <p>U.S. Army Research Laboratory Adelphi, MD SMART Fellow July 2013 - July 2017 <i>Computational and Information Sciences Directorate</i></p> <p>Washington University in St. Louis St. Louis, MO Research Assistant July 2010 - July 2012 <i>Department of Mathematics; Division of Biostatistics</i></p>
EDUCATION	<p>University of Pennsylvania Philadelphia, PA Ph. D., Electrical & Systems Engineering August 2017 <i>Thesis: "Stochastic Optimization for Multi-Agent Statistical Learning and Control"</i> GPA: 3.72; <i>Advisor: Prof. Alejandro Ribeiro</i></p> <p>The Wharton School, University of Pennsylvania Philadelphia, PA M. Sc. Statistics August 2017 <i>Thesis: "Parameter Estimation in High-Dimensions using Doubly Stochastic Approximation"</i> GPA: 3.72; <i>Advisor: Prof. Dylan Small</i></p> <p>Washington University St. Louis, MO M. Sc. Systems Science & Mathematics May 2012 GPA: 3.63; <i>Advisor: Prof. Hiro Mukai</i></p> <p>Washington University St. Louis, MO B.A. Mathematics, Magna Cum Laude May 2011 <i>Thesis: "Stochastic Methods for the Lotka-Volterra Model with Migration"</i> GPA: 3.66; <i>Advisor: Prof. Renato Feres</i></p>
ACADEMIC HONORS	<ul style="list-style-type: none">• IEEE Asilomar Signals, Systems, & Computers Best Paper Finalist Nov. 2017• SMART National Fellowship, sponsored by U.S. Defense Dept. Summer 2013• University of Pennsylvania Fellowship Award for graduate studies Fall 2012• George Washington University Fellowship Award for graduate studies Fall 2012• Latin Honors: Magna Cum Laude, WashU Dept. of Mathematics Spring 2011

PROFESSIONAL AFFILIATIONS AND SERVICES

- Member of: IEEE Signal Processing Society. Mathematical Optimization Society, INFORMS Optimization Society
- Reviewer the following publications: SIAM Journal on Optimization, IEEE Transactions on Signal Processing, IEEE Transactions on Automatic Control, IEEE Transactions on Control of Network Systems, IEEE Int. Conf. Acoustics, Speech, Signal Process., IEEE Workshop on Signal Process. Advances in Wireless Com., IEEE Conference on Decision and Control (CDC)
- Conference sessions chaired: IEEE Asilomar Conference, Nov. 2015; INFORMS Optimization Society Conference, Mar. 2016; INFORMS Optimization Society Conference, Mar. 2018; INFORMS Annual Meeting, Nov. 2018
- UPenn ESE Phd Student Colloquium Coordinator Fall 2013-Summer 2017
- UPenn Graduate Students Engineering Group (GSEG) Rep. Fall 2015-Summer 2017

PUBLICATIONS

Journal Papers

1. A. Koppel, K. Zhang, H. Zhu, and T. M. Baser. "Projected Stochastic Primal-Dual Method for Constrained Online Learning with Kernels" in *IEEE Trans. Signal Process.* (submitted), Apr. 2018.
2. A. Bedi Singh, A. Koppel, and K. Rajawat. "Nonparametric Compositional Stochastic Optimization: Algorithms for Robust Online Learning with Kernels," in *Mathematical Programming* (submitted), Apr. 2018.
3. A. Koppel, E. Tolstaya, E. Stump, and A. Ribeiro. "Nonparametric Stochastic Compositional Gradient Descent for Q-Learning in Continuous Markov Decision Problems" in *IEEE Trans. Automatic Control* (submitted), Mar. 2018.
4. A. S. Bedi, A. Koppel, and K. Rejawat. "Asynchronous Decentralized Stochastic Optimization in Heterogeneous Networks" in *IEEE Trans. Signal Process.* (submitted), Dec 2017.
5. A. Koppel, G. Warnell, E. Stump, P. Stone, and A. Ribeiro. "Policy Evaluation in Continuous MDPs with Efficient Kernelized Gradient Temporal Difference," in *IEEE Trans. Automatic Control* (submitted), Dec. 2017.
6. M. Fazlyab, A. Koppel, V. Preciado, and A. Ribeiro, "A Variational Approach to Dual Methods for Constrained Convex Optimization," in *IEEE Trans. Automatic Control* (submitted), Nov. 2017.
7. A. Koppel, S. Paternain, C. Richard, and A. Ribeiro, "Decentralized Online Learning with Kernels", in *IEEE Trans. Signal Process* (to appear), Apr. 2018.
8. A. Koppel, G. Warnell, E. Stump, and A. Ribeiro, "Parsimonious Online Learning with Kernels via Sparse Projections in Function Space," in *Journal of Machine Learning Research* (under review), Nov. 2016
9. A. Mokhtari, A. Koppel, and A. Ribeiro, "A Class of Doubly Random Parallel Stochastic Methods for Large Scale Learning," in *Journal of Machine Learning Research* (under review), June 2016
10. A. Koppel, B. Sadler, and A. Ribeiro, "Proximity without Consensus in Online Multi-Agent Optimization," in *IEEE Trans. Signal Proc*, Volume: 65 Issue: 12 , Page 3062-3077, June 15, 2017.
11. A. Koppel, G. Warnell, E. Stump, and A. Ribeiro, "D4L: Decentralized Dynamic Discriminative Dictionary Learning," *IEEE Trans. Signal Info. Process. over Networks*, Mar. 2017.
12. A. Simonetto, A. Koppel, A. Mokhtari, G. Leeus, and A. Ribeiro, "Decentralized Prediction-

Correction Methods for Networked Time-Varying Convex Optimization,” *IEEE Trans. Automatic Control*, Volume 62, Issue 11. Nov, 2017.

13. A. Simonetto, A. Mokhtari, A. Koppel, G. Leeus, and A. Ribeiro, “A Class of Prediction-Correction Methods for Time-Varying Convex Optimization,” *IEEE Trans. Signal Process.*, Sept. 2015’.
14. A. Koppel, F. Jakubeic, and A. Ribeiro, “A saddle point algorithm for networked online convex optimization,” *IEEE Trans. Signal Process.*, Oct. 2015.

Conference Papers

1. A. Koppel, S. Paternain, C. Richard, and A. Ribeiro, “Decentralized Online Nonparametric Learning”, in Proc. Asilomar Conf. Signals, Systems, Computers. (submitted), Pacific Grove, CA, Oct. 28-31, 2018.
2. A. S. Bedi, A. Koppel, and K. Rajawat, “Asynchronous Saddle Point Method: Interference Management Through Pricing,” in *IEEE Conf. on Decision and Control (CDC)* (submitted), Miami Beach, FL, Dec. 17-19, 2018.
3. K. Zhang, H. Zhu, T. Baser, and A. Koppel, “Projected Stochastic Primal-Dual Method for Constrained Online Learning with Kernels,” in *IEEE Conf. on Decision and Control (CDC)* (submitted), Miami Beach, FL, Dec. 17-19, 2018.
4. E. Tolstaya, E. Stump, A. Koppel, and A. Ribeiro, “Composable Learning with Sparse Kernel Representations,” in *International Conference on Intelligent Robots and Systems (IROS)* (submitted), Madrid, Spain, Oct 1-5, 2018.
5. E. Tolstaya, A. Koppel, E. Stump, and A. Ribeiro, “Nonparametric Stochastic Compositional Gradient Descent for Q-Learning in Continuous Markov Decision Problems,” in *American Control Conference* (to appear), Milwaukee, WI, June 27-29, 2018.
6. A. Koppel, A. Mokhtari, and A. Ribeiro, “Parallel Stochastic Successive Convex Approximation Method for Large-Scale Dictionary Learning,” in *Proc. Int. Conf. Acoustics Speech Signal Process*, Calgary, Canada, Apr. 15-20, 2018.
7. A. Koppel, S. Paternain, C. Richard, and A. Ribeiro, “Decentralized Efficient Nonparametric Stochastic Optimization”, in *IEEE Global Conference on Signal and Information Processing*, Montreal, Canada, Nov. 14-16, 2017.
8. A. S. Bedi, A. Koppel, and K. Rejawat, “Beyond Consensus and Synchrony in Decentralized Online Optimization using Saddle Point Method” in *Proc. Asilomar Conf. on Signals Systems Computers* (to appear), Pacific Grove, CA, Oct. 29-Nov. 1, 2017.
9. M. Fazylab, A. Koppel, V. Preciado, and A. Ribeiro, “A Variational Approach to Dual Methods for Constrained Convex Optimization,” in *American Control Conference*, Seattle, WA, May 24-26, 2017.
10. A. Mokhtari, A. Koppel, and G. Scutari, A. Ribeiro, “Large-Scale Non-Convex Stochastic Optimization by Doubly Stochastic Successive Convex Approximation,” in *Proc. Int. Conf. Acoustics Speech Signal Processing*, New Orleans, LA, USA Mar. 5-9 2017.
11. A. Koppel, G. Warnell, E. Stump, and A. Ribeiro, “Parsimonious Online Learning with Kernels via Sparse Projections in Function Space,” in *Proc. Int. Conf. Acoustics Speech Signal Process*, New Orleans, LA, USA Mar. 5-9 2017.
12. A. Koppel, B. M. Sadler, and A. Ribeiro, “Decentralized Online Optimization with Heterogeneous Data Sources”, *IEEE Global Conference on Signal and Information Processing* (to appear), Washington, DC, Dec. 7-9, 2016.
13. A. Koppel, A. Mokhtari, and A. Ribeiro “Doubly Random Parallel Stochastic Methods for Large Scale Optimization.” in *Proc. Asilomar Conf. on Signals Systems Computers*, Pacific Grove, CA, November 6-9 2016.

14. A. Koppel, J. Fink, G. Warnell, E. Stump, and A. Ribeiro, "Online Learning for Characterizing Unknown Environments in Ground Robotic Vehicle Models," in *Proc. Int. Conf. Intelligent Robotics and Systems*, South Korea, Oct. 2016
15. A. Simonetto, A. Koppel, A. Mokhtari, G. Leus, and A. Ribeiro, "A Quasi-Newton Prediction-Correction Method for Decentralized Dynamic Convex Optimization", *European Control Conference*, Aalborg, Denmark, June 29 - July 1, 2016.
16. A. Mokhtari, A. Koppel, and A. Ribeiro, "Doubly Random Parallel Stochastic Methods for Large Scale Learning," in *American Control Conference*, Boston, MA, July 6-8 2016.
17. A. Koppel, B. M. Sadler and A. Ribeiro, "Proximity without consensus in online multi-agent optimization," in *Proc. Int. Conf. Acoustics Speech Signal Process*, Shanghai, China, Mar. 20-25 2016.
18. A. Simonetto, A. Mokhtari, A. Koppel, G. Leus, and A. Ribeiro, "A Decentralized Prediction-Correction Method for Networked Time-Varying Convex Optimization", *IEEE Workshop on Computational Advances in Multi-Sensor Adaptive Processing*, Cancun, Mexico, Dec. 13-16, 2015.
19. A. Koppel, A. Simonetto, A. Mokhtari, G. Leus, and A. Ribeiro, "Target Tracking with Dynamic Convex Optimization", *IEEE Global Conference on Signal and Information Processing*, Orlando, FL, Dec. 14-16, 2015.
20. A. Simonetto, A. Mokhtari, A. Koppel, G. Leeus, and A. Ribeiro "Prediction-Correction Methods for Time-Varying Convex Optimization." in *Proc. Asilomar Conf. on Signals Systems Computers*, Pacific Grove, CA, November 8-11 2015.
21. A. Koppel, G. Warnell, E. Stump, and A. Ribeiro "Task-Driven Dictionary Learning in Distributed Online Settings." in *Proc. Asilomar Conf. on Signals Systems Computers*, Pacific Grove, CA, November 8-11 2015.
22. A. Koppel, G. Warnell, E. Stump, and A. Ribeiro, "D4L: Decentralized Dynamic Discriminative Dictionary Learning," in *Proc. Int. Conf. Intelligent Robotics and Systems*, Hamburg, Germany, Sep 28-Oct2 2015.
23. A. Koppel, F. Jakubeic and A. Ribeiro, "Regret Bounds of a distributed saddle point algorithm," in *Proc. Int. Conf. Acoustics Speech Signal Process.*, Brisbane Australia, Apr 19-24 2015.
24. A. Koppel, F. Y. Jakubiec, and A. Ribeiro, "A Saddle Point Algorithm for Networked Online Convex Optimization." in *39th Proc. Int. Conf. Acoust. Speech Signal Process.*, May 4-9 2014, pp. 8292 - 8296.

SKILLS

- *Programming Languages*: MATLAB & SIMULINK, Python, R, SAS
- *Applications*: LATEX, Microsoft Office, CVX
- *Operating Systems*: Microsoft Windows 7/XP/2000, Linux, Ubuntu, Mac OSX
- *Languages*: English (native), Spanish (proficient)

TEACHING
EXPERIENCE**Teaching Certification, UPenn's Center for Teaching & Learning**

Fall 2015

Teaching assistant, University of Pennsylvania

- "Signal and Information Processing" (Instructor: Prof. Ribeiro) Spring 2015
- "Modern Convex Optimization" (Instructor: Prof. Ribeiro) Spring 2014
- "Engineering Probability", (Instructor: Prof. Sarkar) Fall 2013

Teaching assistant & Peer Academic Mentor, WashU

- "Calculus of Several Variables" (Instructor: Prof. Thornton) Spring 2011
- "Matrix Algebra" (Instructor: Prof. Freiwald) Fall 2010
- "Calculus III", (Instructor: Prof. Blank) Fall 2010
- "Calculus II", (Instructor: Prof. Feres) Spring 2009