

Po-Wei Wang

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Education

PhD student, Machine Learning Dept., Carnegie Mellon University Aug. 2015 – Now

– Advised by Prof. J. Zico Kolter

B.S., Computer Science Dept., National Taiwan University Sep. 2008 – June 2012

– Advised by Prof. Chih-Jen Lin

Summary

I am a fourth-year PhD student in the Machine Learning Department at Carnegie Mellon University, advised by Prof. Zico Kolter. Before that, I was an undergrad in the CSIE Department at National Taiwan University, working with Prof. Chih-Jen Lin on convergence properties of SVMs. My interests cover both theories and applications for convex/nonconvex optimization.

Research Experience

1. **Global optimal convergence of low-rank SDPs on spherical manifolds** [5, 2, 1]
 - Proved the Gauss-Seidel dynamic converges to a global optimum on non-convex unit sphere, solving a 17-yr open problem in semidefinite program.
 - The proposed method scaled to millions of variables, making the SDP practical.
 - Orders of magnitude faster than existing methods in experiments w/ application in MAXSAT.
2. **Global linear convergence for non-strongly convex problems (i.e., RSC)** [10]
 - Proved the first global linear rate for first-order methods on non-strongly convex problems.
 - Applied to cyclic coordinate descent methods for dual SVC and SVR, published in JMLR.
 - Solved the open problem of convergence rate of the Gauss-Seidel method on PSD matrices.
3. **The common-direction solver for linear classification** [6, 7]
 - Proved that “multi-directional line-search can guarantee optimal rate like Nesterov”.
 - Idea: Reusing gradient information to reduce communication time in distributed optimization.
 - Outperformed state-of-the-art first- and second-order methods in experiments.
4. **Polynomial optimization methods for matrix factorization** [4]
 - Idea: Bi-direction line-search in matrix factorization has closed-form solution in SOS.
 - Applied Durand-Kerner method in numerical optimization to accelerate the process.
 - Achieved empirical speedup and lower objective values in benchmarks.
5. **Disciplined convex optimization by proximal and epigraph projection** [8, 9]
 - Solved the conic program in cvxpy by fast proximal and epigraph projection operators.
 - New algorithms for the implicit dual problem and piece-wise linear functions.
 - Orders of magnitude faster than existing general-purpose optimization solvers.

Publications

1. **Low-rank semidefinite programming for the MAX2SAT problem.** Po-Wei Wang and J. Zico Kolter. *AAAI, 2019*
2. **The Mixing method: low-rank coordinate descent for semidefinite programming with diagonal constraints.** Po-Wei Wang, Wei-Cheng Chang, and J. Zico Kolter. *Tech report, 2017*
3. **Realtime query completion via deep language models.** Po-Wei Wang, Huan Zhang, Vijai Mohan, Inderjit S. Dhillon, and J. Zico Kolter. *SIGIR eCom, 2018*

4. **Polynomial optimization methods for matrix factorization.** Po-Wei Wang, Chun-Liang Li, and J. Zico Kolter. *AAAI*, 2017
5. **The Mixing method for Maxcut-SDP problem.** Po-Wei Wang and J. Zico Kolter. *NIPS LHDS Workshop*, 2016
6. **Limited-memory common-directions method for distributed optimization and its application on empirical risk minimization.** Ching-pei Lee, Po-Wei Wang, Weizhu Chen, and Chih-Jen Lin. *SDM*, 2017.
7. **The Common-directions Method for Regularized Empirical Risk Minimization.** Po-Wei Wang, Ching-pei Lee, and Chih-Jen Lin. *Tech report*.
8. **Epigraph Projections for Fast General Convex Programming.** Po-Wei Wang, Matt Wytock, and J. Zico Kolter. *ICML*, 2016
9. **Epigraph Proximal Algorithms for General Convex Programming.** Matt Wytock, Po-Wei Wang, and J. Zico Kolter. *Proceedings of the NIPS 2015 Optimization Workshop*
10. **Iteration Complexity of Feasible Descent Methods for Convex Optimization.** Po-Wei Wang and Chih-Jen Lin. *The Journal of Machine Learning Research* 15, 1523-1548
11. **Support Vector Machines.** Po-Wei Wang and Chih-Jen Lin. *Data Classification: Algorithms and Applications*. CRC Press. 2014
12. **On Convergence Rate of Concave-Convex Procedure.** Ian E.H. Yen, Nanyun Peng, Po-Wei Wang, Shou-De Lin. *Proceedings of the NIPS 2012 Optimization Workshop*

Selected Awards

1. Double Championships in KDD Cup competition on Music Rating Prediction (2011)
2. Third Place in Robocup Standard Platform League World Final (2011)

Professional Services

1. Reviewer for Journal of Machine Learning Research (JMLR), Data Mining and Knowledge Discovery (DAMI), IEEE Conference on Decision and Control (CDC'14), Neural Information Processing Systems (NIPS), International Conference on Machine Learning (ICML), IEEE Transactions on Knowledge and Data Engineering (TKDE), and Neurocomputing.
2. Organizer of NTU Machine Learning Symposium 2014

Teaching and Work Experience

1. Head TA for Convex Optimization (10-725) by Ryan Tibshirani. Aug 2018 – Dec 2018
2. Intern at A9 (Amazon) for Real-time Deep Query Completion. May 2017 – Aug 2017
 - Filed a patent for A9 and was gifted a scholarship.
3. RA in Machine Learning Group of Prof. Chih-Jen Lin. Jun 2012 – Feb 2013, Apr 2014 – Jul 2015
 - Worked on SVM and convergence rates.
4. Substitute Military Service at Airport (conscription). Apr 2013 – Apr 2014
5. Advisor in High School Computer Science Club. 2008 – 2015
 - Teaching C-programming, algorithms, and micro-controllers in my high school's computer science club for 6 years. Also worked as an advisor in science affairs.