

Nachuan Xiao

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Education

Academy of Mathematics and Systems Sciences

Chinese Academy of Sciences, Beijing, China

Ph.D. in Computational Mathematics

Advisor: Prof. Ya-xiang Yuan

September 2016 – June 2021

School of Mathematical Science

Fudan University, Shanghai, China

B.S. in Mathematics

September 2012 – June 2016

Academic Experience

Institute of Operations Research and Analytics (IORA)

National University of Singapore, Singapore

Research Fellow

Advisor: Prof. Kim-Chuan Toh

August 2021 – present

Research Interests

- Optimization over Riemannian manifolds
- Nonsmooth optimization
- Constrained optimization

My research interests include numerical methods for optimization problems on Riemannian manifolds arisen from statistics and machine learning problems. I am also interested in designing algorithms for minimizing nonsmooth functions with constraints, especially for those problems related to deep learning.

Publications

1. **Nachuan Xiao**, Xin Liu* and Ya-xiang Yuan, Exact penalty function for $\ell_{2,1}$ norm minimization over the Stiefel manifold, SIAM Journal on Optimization, 2021, 31(4): 3097-3126. (link)
2. **Nachuan Xiao**, Xin Liu* and Ya-xiang Yuan, A class of smooth exact penalty function methods for optimization problems with orthogonality constraints. Optimization Methods and Software, 2022, 37:4, 1205-1241. (link)
3. **Nachuan Xiao**, Xin Liu and Kim-Chuan Toh*, Dissolving constraints for Riemannian optimization, Mathematics of Operations Research (to appear). (link)
4. Xiaoyin Hu, **Nachuan Xiao***, Xin Liu and Kim-Chuan Toh, An improved unconstrained approach for bilevel optimization, SIAM Journal on Optimization (to appear). (link)

Preprints

1. Xin Liu, **Nachuan Xiao*** and Ya-xiang Yuan, A penalty-free infeasible approach for a class of nonsmooth optimization problems over the Stiefel manifold, submitted, arXiv:2103.03514
2. **Nachuan Xiao** and Xin Liu*, Solving optimization problems over the Stiefel manifold by smooth exact penalty function, submitted, arXiv:2110.08986
3. Xiaoyin Hu, **Nachuan Xiao***, Xin Liu and Kim-Chuan Toh, A constraint dissolving approach for nonsmooth optimization over the Stiefel manifold, submitted, arXiv:2205.10500
4. **Nachuan Xiao**, Xiaoyin Hu*, Xin Liu and Kim-Chuan Toh, CDOpt: A Python package for a class of Riemannian optimization, submitted, arXiv:2212.02698
5. **Nachuan Xiao**, Xin Liu* and Kim-Chuan Toh, A partial exact penalty function approach for constrained optimization, submitted, arXiv:2304.01467

6. Tianyun Tang, Kim-Chuan Toh, **Nachuan Xiao***, Yinyu Ye, A Riemannian dimension-reduced second order method with application to sensor network localization, submitted. arXiv:2304.10092
7. **Nachuan Xiao**, Xiaoyin Hu*, Xin Liu, Kim-Chuan Toh, Adam-family methods for nonsmooth optimization with convergence guarantees, submitted. arXiv:2305.03938

Software

- CDOpt: A Python Package for a Class of Riemannian Optimization. (website)
- STOP: A toolbox for STiefel manifold OPTimization. (website)

Presentations

- The 8th Youth Symposium on Scientific and Engineering Computing of Scientific Computing Forum, 2022.12, Beijing, China.
- The 17th Annual Meeting of China Society for Industrial and Applied Mathematics, 2019.09, Foshan, China.
- The 12th International Conference on Numerical Optimization and Numerical Linear Algebra, 2019.04, Shangrao, China.

Honors & Awards

- Second Prize in Tianchi Competition on Algorithm Design for Fabric Packing Problems (2/832)
- Excellence Award in Alibaba Global Mathematics Competition, 2018

Referred Journals

- Mathematical Programming Computation
- Journal of Industrial and Mathematical Optimization