Nachuan Xiao

📱 (+86) 18810835770   •   ✉ xnc@lsec.cc.ac.cn   •   🌐 xnchxy.github.io

Google Scholar   ♨ 1995.2.11

Education

Academy of Mathematics and Systems Science
Chinese Academy of Sciences, Beijing, China   **September 2016 – July 2021**
Ph.D. in Computational Mathematics
Advisor: Prof. Ya-xiang Yuan

School of Mathematical Science
Fudan University, Shanghai, China   **September 2012 – June 2016**
B.S. in Mathematics

Academic Experience

Institute of Operations Research and Analytics (IORA)
National University of Singapore, Singapore   **August 2021 – present**
Research Fellow
Advisor: Prof. Kim-Chuan Toh

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**, Xiaoyin Hu*, Xin Liu, Kim-Chuan Toh, Adam-family methods for nonsmooth optimization with convergence guarantees, Journal of Machine Learning Research 25(48):1-53, 2024. (link)
2. **Nachuan Xiao**, Xin Liu, Kim-Chuan Toh*, Dissolving constraints for Riemannian optimization, Mathematics of Operations Research (to appear). (link)
3. Tianyun Tang, Kim-Chuan Toh, **Nachuan Xiao***, Yinyu Ye, A Riemannian dimension-reduced second order method with application to sensor network localization, SIAM Journal on Scientific Computing (to appear). (link))
4. Xiaoyin Hu, **Nachuan Xiao***, Xin Liu, Kim-Chuan Toh, A constraint dissolving approach for nonsmooth optimization over the Stiefel manifold, IMA Journal of Numerical Analysis (to appear). (link)
5. Xiaoyin Hu, **Nachuan Xiao***, Xin Liu, Kim-Chuan Toh, An improved unconstrained approach for bilevel optimization, SIAM Journal on Optimization, 2023, 33(4): 2801-2829. (link)
6. **Nachuan Xiao**, Xin Liu*, 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)
7. **Nachuan Xiao**, Xin Liu*, 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)
8. Xin Liu, **Nachuan Xiao***, Ya-xiang Yuan, A penalty-free infeasible approach for a class of nonsmooth optimization problems over the Stiefel manifold, Journal of Scientific Computing (to appear). (link)
9. **Nachuan Xiao**, Xin Liu*, Solving optimization problems over the Stiefel manifold by smooth exact penalty function, Journal of Computational Mathematics (to appear). (link)
10. Xiaoyin Hu, Xin Liu, **Nachuan Xiao***, Convergence properties of stochastic proximal subgradient method in solving a class of composite optimization problems with cardinality regularizer, Journal of Industrial and Management Optimization, 2024, 20(5): 1934-1950. (link)

Preprints

1. **Nachuan Xiao**, Xiaoyin Hu*, Xin Liu, Kim-Chuan Toh, CDOpt: A Python package for a class of Riemannian optimization, submitted. arXiv:2212.02698
2. **Nachuan Xiao**, Xin Liu*, Kim-Chuan Toh, A partial exact penalty function approach for constrained optimization, submitted. arXiv:2304.01467
3. **Nachuan Xiao**, Xiaoyin Hu*, Kim-Chuan Toh, Convergence guarantees for stochastic subgradient methods in nonsmooth nonconvex optimization, submitted. arXiv:2307.10053
4. Kuangyu Ding, **Nachuan Xiao***, Kim-Chuan Toh, Adam-family methods with decoupled weight decay in deep learning, submitted. arXiv:2310.08858

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.
- SIAM Journal on Optimization.
- IEEE Transaction on Signal Processing.
- Journal of Scientific Computing.
- Journal of Global Optimization.
- Journal of Industrial and Management Optimization.