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PREFACE: SPECIAL ISSUE ON THEORY AND ALGORITHMS FOR DATA-DRIVEN OPTIMIZATION

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The optimization method is one of the core techniques to solve practical problems arising from science and engineering. With the rapid development of data science, comprehensive integration of massive data and optimization methods are required to make engineering and business decisions smarter, more agile, and more efficient. The data-driven optimization method has become an important tool in many fields including machine learning, image science, signal processing, and so on. Optimization over data-driven systems is a challenging task, which has attracted significant attention in the recent literature. The main purpose of this special issue is to reflect the latest advances in theory and algorithms for data-driven optimization methods. We solicited 17 high-quality papers on theory and algorithms for data-driven optimization. Topics of the special issue cover the fields of nonconvex optimization theory and analysis, stochastic optimization and applications, matrix and tensor computational methods and theory, numerical optimization methods in machine learning, and optimization algorithms and theory in image science, signal processing.

(i) **Nonconvex optimization theory and analysis.** Contributions in this topic include new progress in the bilinear saddle point problem, the duality theory for standard bilevel programming problems with convex constraints, and the branch-and-bound algorithm for globally solving a class of multiplicative problems. See [2, 3, 5].

(ii) **Stochastic optimization and applications.** Contributions in this topic include the statistical analysis in robust optimization models with the special case of ambiguity sets, with the applications in machine learning and finance. See [16].

(iii) **Matrix and tensor computational methods and theory.** Contributions in this topic include the new progress in primal-dual interior-point methods for semidefinite optimization problems, stochastic conditioning of tensor functions, higher order correlation analysis for multiview, theoretical analysis and models for quaternion matrices and the third order tensors, numerical algorithms for special complementarity problems, as well as graph theory. See [1, 6, 9, 11–13, 17].

(iv) **Numerical optimization methods in machine learning.** Contributions in this topic include a semi-supervised spectrum sensing algorithm based on the semi-supervised adversarial autoencoder model as well as the statistical analysis and a numerical method for the second-order least squares estimator. See [8, 15].

(v) **Optimization algorithms and theory in image science, signal processing.** Contributions in this topic include new progress in optimization models and numerical algorithms, especially for blind deconvolution of multiple observed images with missing values, compressive sensing image reconstruction corrupted by impulsive noise, l_1 trend filtering problem, and noisy tensor completion for remote sensing data. See [4,7,10,14].

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[2] Xiaokai Chang and Junfeng Yang, "New convergence results of the golden ratio primal-dual algorithm".

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[4] Yihang Gao, Xuelei Lin, and Michael K. Ng, "Blind deconvolution for multiple observed images with missing values".

[5] Hongwei Jiao, Wenjie Wang, and Peiping Shen, "Piecewise linear relaxation method for globally solving a class of multiplicative problems".

[6] Yu-Fan Li, Zheng-Hai Huang, and Nana Dai, "Two methods for finding a sparse solution of the linear complementarity problem with a Z-matrix".

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[9] Hongying Lin and Bo Zhou, "On the reverse distance spectral radius of graphs".

[10] Yongjin Liu and Tiqi Zhang, "Sparse Hessian based semismooth Newton augmented Lagrangian algorithm for general ℓ_1 trend filtering".

[11] Yun Miao, Tianru Wang, and Yimin Wei, "Stochastic conditioning of tensor functions based on the tensor-tensor decomposition".

[12] Jiawang Nie, Li Wang, and Zequn Zheng, "Higher order correlation analysis for multi-view".

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[14] Andong Wang, Guoxu Zhou, Zhong Jin, and Qibin Zhao, "Noisy tensor completion via orientation invariant tubal nuclear norm".

[15] Xin Wang, Lingchen Kong, and Liqun Wang, "Numerical optimization and computation for second-order least squares estimation".

[16] Huifu Xu and Sainan Zhang, "Quantitative statistical robustness in distributionally robust optimization models".

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