Zhichao Jia

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EDUCATION

Johns Hopkins University, Baltimore, MD   Dec. 2022
Master of Science and Engineering in Applied Mathematics and Statistics; GPA: 4.0/4.0
Thesis: First-Order Methods for Nonsmooth Nonconvex Functional Constrained Optimization with or without Slater Points
Advisor: Benjamin Grimmer
Courses: Nonlinear Optimization, Stochastic Optimization, Large-Scale Optimization, Control Theory, Statistical Theory

Sun Yat-Sen University, Guangzhou, China   Jun. 2021
Bachelor of Science in Information and Computing Science; GPA: 3.7/4.0
Thesis: On an FFHE-Inspired Method for Effectively Solving Differential Riccati Equations
Advisor: Tao Wang
Courses: Real Analysis, Linear Algebra, Numerical Methods, Statistics, Optimization Methods, Machine Learning, Data Mining

RESEARCH EXPERIENCE AND PUBLICATIONS

First-Order Methods for Nonsmooth Nonconvex Constrained Optimization   Oct. 2021 - present
Advisor: Assistant Professor Benjamin Grimmer   Johns Hopkins University, MD

- **Algorithm Design and Theoretical Analysis**: Present a modified inexactly proximally guided switching subgradient method solving nonsmooth nonconvex constrained optimization problems based on newly proposed Slater point-type assumptions and measurements of stationarity; provide theoretical results on its convergence rates and feasibility guarantees without domain compactness assumption; conduct numerical experiments on sparse phase retrieval problems.

"First-Order Methods for Nonsmooth Nonconvex Functional Constrained Optimization with or without Slater Points" by **Z. Jia**, B. Grimmer, in preparation for *SIAM Journal on Optimization* submission [**arXiv**].

The SPSA method for Constrained Stochastic Optimization   May 2022 - present
Advisor: Professor James Spall   Johns Hopkins University, MD

- **SPSA-based Constrained Algorithms**: Propose an SPSA-based switch updating method and an SPSA-based random-search projection method built on the simultaneous perturbation stochastic approximation (SPSA) solving (noisily) constrained stochastic problems under specific assumptions; show convergence results and numerical performances of them.
- **Distributions of SPSA Sampling**: Generate computational and experimental results on the advantages of non-Bernoulli distributions compared to using Bernoulli distribution in SPSA sampling for specific constrained cases.

"SPSA-Based Switch Updating Algorithm for Constrained Stochastic Optimization" by **Z. Jia**, Z. Wei, submitted to *Conference on Information Science and Systems 2023*.
"SPSA-Based Switch Updating Algorithm for Stochastic Optimization with Noisy Constraints" by **Z. Jia**, Z. Wei, J. Spall, in preparation for Journal submission [**arXiv**].

Stochastic Gradient Descent Methods with Stochastic Polyak Stepsizes (SPS)   Jun. 2022 - present
Advisor: Assistant Professor Nicolas Loizou   Johns Hopkins University, MD

- **SPS in Different Problem Settings**: Apply two variants of SPS to the stochastic gradient descent method to solve weakly convex and sharp (finite-sum) stochastic optimization problems and present their convergence results.
- **SPS in Constrained Algorithms**: Apply one variant of SPS to the stochastic switching subgradient method to solve constrained (finite-sum) stochastic optimization problems and present its convergence result.

The Augmented Lagrangian Method for Nonconvex Problems   May 2020 - Jul. 2020
Advisor: Assistant Professor Jovan Ilic   Carnegie Mellon University, PA (Online)

- **Algorithm Realization and Experimental Analysis**: Implemented the augmented Lagrangian method solving nonconvex optimization problems with equality constraints; compared its performance under different choices of related hyper-parameters and with other classic constrained methods.

"Implementation and Analyzing of Augmented Lagrangian Method" Abstract by **Z. Jia**, Z. Hu, J. Ma, accepted by *International Conference on Applied Physics and Mathematics 2021* (for presentation only).

Applications of the FFHE Method in Time-Varying Control Systems   Jan. 2020 - May 2021
Advisor: Associate Professor Tao Wang   Sun Yat-Sen University, China

- **Applied to CTECQP**: Implemented a tailored novel fast and flexible holomorphic embedding (FFHE) method for solving continuous-time equality constrained quadratic programming (CTECQP) problems.
- **Applied to MDRE**: Extended the FFHE method to dealing with matrix differential Riccati equations (MDRE).

- **Promotion on FFHE**: Carried out certain strategies to optimize the series expansion, rational approximation, adaptive segmentation and automatic correction for the FFHE method and achieved better performance.

"On a Tailored Fast and Flexible Holomorphic Embedding Method for Time-Varying Control Systems" by Y. Ding, **Z. Jia**, Z. Fang, T. Wang, Y. Zhang, submitted to *IEEE Transactions on Automatic Control.*

ACADEMIC SERVICE

- Reviewer for *American Control Conference 2023*
- Grader for *EN.625.714.82: Introductory Stochastic Differential Equations with Applications* at JHU in Summer 2022

TALKS

- **Invited Presentation on "Estimation and Learning in Stochastic Systems"**
  for the 57th Annual Conference on Information Sciences and Systems at JHU   Mar. 2023
- **Extensions of Stochastic Polyak Stepsizes on Weakly Convex and Sharp Functions**
  at JHU Optimization and Machine Learning Group Seminar   Sept. 2022
- **Inexact Proximal Point Method for Nonsmooth Nonconvex Constrained Optimization**
  at JHU AMS Optimization Group Seminar   Aug. 2022

AWARDS

- Third Prize in China Undergraduate Mathematical Contest in Modeling (top 40%) in Sept. 2019
- Ranked 6th in Datathon@LISH in Feb. 2022

SKILLS

- **Programming Languages**: C, C++, Python, Matlab, SQL, R