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

- **First-Order Methods for Nonconvex Nonsmooth 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 nonconvex nonsmooth constrained optimization problems based on newly proposed Slater point-type assumptions and measurements of stationarity; provide theoretical results on its convergence rates, feasibility guarantee and 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 *Society for Industrial and Applied Mathematics Journal on Optimization* submission.

- **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 performance 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, J. Spall, in preparation for *Conference on Information Science and Systems 2023* submission.

- **Stochastic Gradient Descent Methods with Stochastic Polyak Stepsizes** — Jun. 2022 - present
  Advisor: Assistant Professor Nicolas Loizou — Johns Hopkins University, MD
  - **SPS in Different Problem Settings**: Apply two variants of stochastic Polyak stepsizes (SPS) to the stochastic gradient descent method to solve weakly convex and sharp 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 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* (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 achieve 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

- **Inexact Proximal Point Method for Nonconvex Nonsmooth Constrained Optimization**
  at JHU AMS Optimization Group Seminar — Aug. 2022
- **Extensions of Stochastic Polyak Stepsizes on Weakly Convex and Sharp Functions**
  at JHU Optimization and Machine Learning Group Seminar — Sept. 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