

Zihao Hu

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RESEARCH FOCUS

Machine Learning Theory, Riemannian Optimization, Online Decision Making

EDUCATION

- **Georgia Institute of Technology** Atlanta, USA
PhD Candidate in Machine Learning; Advisor: Jacob Abernethy Aug. 2018 - Dec. 2023 (anticipated)
Courses: Math Foundations of ML, Machine Learning Theory, Theoretical Statistics, Nonlinear Optimization, Graphical Models in ML.
- **Shanghai Jiao Tong University** Shanghai, China
M.S. in Computer Science; Advisor: Hongtao Lu; GPA: 3.89/4.00, Rank: 3/115 Mar. 2018
- **Huazhong University of Science and Technology** Wuhan, China
BSEE in Telecommunications; GPA: 84.55/100 June 2015

PUBLICATIONS

- **Zihao Hu**, Guanghui Wang, Jacob Abernethy. On Riemannian Projection-free Online Learning. In submission. arXiv: 2305.19349.
- Guanghui Wang, **Zihao Hu**, Vidya Muthukumar, Jacob Abernethy. Faster Margin Maximization Rates for Generic Optimization Methods. In submission. arXiv: 2305.17544.
- **Zihao Hu**, Guanghui Wang, Jacob Abernethy. Minimizing Dynamic Regret on Geodesic Metric Spaces. Annual Conference on Learning Theory (COLT) 2023, to appear.
- Guanghui Wang, **Zihao Hu**, Vidya Muthukumar, Jacob Abernethy. Adaptive Oracle-Efficient Online Learning. Conference on Neural Information Processing Systems (NeurIPS) 2022.
- **Zihao Hu**, Junxuan Chen, Hongtao Lu, Tongzhen Zhang. Bayesian Supervised Hashing. Conference on Computer Vision and Pattern Recognition (CVPR) 2017. (Spotlight, 8%).
- Wei Shen, Xiang Bai, **Zihao Hu**, Zhijiang Zhang. Multiple Instance Subspace Learning via Partial Random Projection Tree for Local Reflection Symmetry in Natural Images. Pattern Recognition (PR) 2016.

EXPERIENCE

- **Georgia Institute of Technology** Atlanta, GA
Research Assistant Aug. 2018 - Present
 - **Projection-free Online Learning on Riemannian Manifolds:**
 - Conducted groundbreaking research on projection-free online learning on Riemannian manifolds, replacing metric projection with a linear optimization oracle or a separation oracle.
 - Successfully matched state-of-the-art results in Euclidean space, demonstrating the robustness and effectiveness of the new methodology.
 - **Optimistic Online Learning on Riemannian Manifolds:**
 - Extended the Optimistic Mirror Descent algorithm to Riemannian manifolds in the online improper learning setting through innovative analysis.
 - Considered the aggregation of experts' advice on manifolds and devised novel algorithms with adaptive and dynamic regret guarantees.
 - Achieved regret bounds that align with their counterparts in Euclidean space, validating the effectiveness of the newly developed algorithms.
 - **Adaptive Oracle-Efficient Online Learning:**
 - Concentrated on enhancing oracle-efficient online learning, which utilizes an offline oracle to expedite computation.

- Applied Follow the Perturbed Leader with correlated noise and established a novel condition to attain the first-order bound.
- Demonstrated the applicability of the condition for various online auction problems, including VCG auction with reserves, envy-free k -item pricing, and level auctions.

• Shanghai Jiao Tong University

Shanghai, China

Master Student

Sept. 2015 - Mar. 2018

◦ Bayesian Supervised Hashing for Hyperparameter Tuning:

- Introduced the first Bayesian inference approach for automatic hyperparameter tuning in learning binary hashing codes, significantly reducing the dependency on manual tuning prevalent in prior methods.
- Employed Automatic Relevance Determination (ARD) prior to discern the relative importance of different hashing bits, enhancing model performance.

◦ Two Sigma Financial Modeling Challenge:

- Developed a predictive model for a target variable associated with near-future fluctuations suggested by the VIX index, leveraging anonymized features derived from financial instruments.
- Merged linear regression and genetic programming models with extremely randomized trees, fostering an effective and reliable predictive model.
- Achieved a ranking in the top 7.15% (148 out of 2070 participants) in the final evaluation, underscoring the model's accuracy and effectiveness.

HONORS AND AWARDS

- National Scholarship 2017, Shanghai Jiao Tong University, Shanghai, China (Top 2.6%, 3/115)
- Two Sigma Financial Modeling Challenge 2017, Kaggle (Top 7.15%, 148/2070)
- First Prize in China Post-Graduate Mathematical Contest in Modeling 2016 (Top 1.69%, 150/8872)

SKILLS SUMMARY

- **Languages:** C, C++, Python, Shell Script
- **Tools:** Linux, Git, Mathematica, Matlab