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Yikun Bai

Research Interest

Computational optimal transport, mathematical machine learning, computer vision

Education

Ph.D. Electrical and Computer Engineering 2019 - 2022
The University of Delaware (U.S.) GPA: 4.0/4.0
Thesis: From measure concentration through information theory to machine learning

M.S. Applied Mathematics (Ph.D. Transferred) 2016 - 2018
University of Delaware (U.S.) GPA: 4.0/4.0
Completed qualifying exams in: Functional analysis, Stochastic processes, Hypothesis testing

M.A. Mathematics 2014 - 2016
Marshall University (U.S.) GPA: 4.0/4.0

B.S. Medical Imaging 2007 - 2012
Mudanjiang Medical University (China) Grade: 83/100

Research Experience

- **Computer Science Department, Vanderbilt University** 2022/02 - Present
  Postdoctoral Researcher
  - Developed algorithms for various Optimal Transport (OT) problems, including Partial OT, Linear OT, and Partial Gromov-Wasserstein, etc.
  - Conducted extensive theoretical research in computational OT and related concepts (metric property, convergence analysis, barycenter, gradient flow, etc).
  - Designed and executed experiments applying OT in several machine-learning/computer vision tasks, such as shape registration, interpolation, retrieval, and color adaptation.
  - Participated in other machine learning tasks, including Wasserstein auto-encoder, self-supervised learning, and Wasserstein gradient flow.
  - **Achievements:**
    * Lead author of research papers published at CVPR 2023 and ICML 2023.
    * Co-lead author of research papers presented at the NeurIPS OT Workshop 2023, ICLR 2023, and ICML 2024.

- **University of Delaware** 2019 - 2021
  Research Assistant Newark, DE
  - Led theoretical studies exploring the connections between entropic OT and measure concentration theory.
  - **Achievements:**
    * Lead author on papers published in ISIT 2019 and TIT 2021.
    * Second author on papers published in ISIT 2020 and JMLR 2023.

Awards

- Travel grant of KIAS(Korea Institute For Advanced Study) Seoul University, 2023
- Travel grant of Southeastern Analysis Meeting 39 Clemson University, 2023
- ECE Research Day 2021 poster sessions University of Delaware, 2021
- GEMS project fund University of Delaware, 2017

Teaching Experience

Visiting Instructor — **Vanderbilt University**

- Foundations of Machine Learning (CS5262) — Fall 2023

Teaching Assistant — **University of Delaware**

- Advanced Machine Learning (ELEG 867, ELEG 602) — Spring 2019, Fall 2020
- Convex Optimization (ELEG 667) — Fall 2019
- Random Signals and Probability (ELEG 310) — Spring 2020, Spring 2021
- Statistics (MATH 210) — Spring 2018, Fall 2018
- Calculus and Analytic Geometry (MATH 241, MATH 221) — Fall 2016, Spring 2017

Publications

Preprint

- Xinran Liu, **Yikun Bai**, Yuzhe Lu, Andrea Soltoggio, and Soheil Kolouri. Wasserstein task embedding for measuring task similarities. *arXiv preprint arXiv:2208.11726*, 2022
- **Yikun Bai**, Huy Tran, Steven B Damelin, and Soheil Kolouri. Partial transport for point-cloud registration. *arXiv preprint arXiv:2309.15787*, 2023
- Yikun Bai, Rocio Diaz Martin, Hengrong Du, Ashkan Shahbazi, and Soheil Kolouri. Efficient solvers for partial gromov-wasserstein. *arXiv preprint arXiv:2402.03664*, 2024

Conference

- Huy Tran*, **Yikun Bai***, Abihith Kothapalli*, Ashkan Shahbazi, Xinran Liu, Rocio Diaz Martin, and Soheil Kolouri. Stereographic spherical sliced wasserstein distances. *International Conference on Machine Learning*, 2024
- Rocio P Diaz Martin*, Ivan Vladimir Medri*, **Yikun Bai***, Xinran Liu, Kangbai Yan, Gustavo Rohde, and Soheil Kolouri. Lcot: Linear circular optimal transport. *International Conference on Learning Representations (ICLR)*, 2024
- Xinran Liu*, **Yikun Bai***, Zhanqi Zhu, Mathew Thorpe, and Soheil Kolouri. Ptlp: Partial transport lp distances. *Optimal Transport and Machine Learning Workshop at Neural Information Processing Systems (NeurIPS)*, 2023
- **Yikun Bai**, Ivan Vladimir Medri, Rocio Diaz Martin, Rana Shahroz, and Soheil Kolouri. Linear optimal partial transport embedding. In *International Conference on Machine Learning*, pages 1492–1520. PMLR, 2023
- **Yikun Bai***, Bernhard Schmitzer*, Mathew Thorpe, and Soheil Kolouri. Sliced optimal partial transport. *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2023
- Daria Reshetova, **Yikun Bai**, Xiugang Wu, and Ayfer Özgür. Understanding entropic regularization in gans. In *2021 IEEE International Symposium on Information Theory (ISIT)*, pages 825–830. IEEE, 2021
- **Yikun Bai**, Xiugang Wu, and Ayfer Özgür. Information constrained optimal transport: From talagrand, to marton, to cover. In *2020 IEEE International Symposium on Information Theory (ISIT)*, pages 2210–2215. IEEE, 2020

Journal

- Daria Reshetova, **Yikun Bai**, Xiugang Wu, and Ayfer Ozgur. Understanding entropic regularization in gans. In *Journal of Machine Learning Research*, 2023
- **Yikun Bai**, Xiugang Wu, and Ayfer Özgür. Information constrained optimal transport: From talagrand, to marton, to cover. *IEEE Transactions on Information Theory*, 69(4):2059–2073, 2023
- Scott A Sarra and **Yikun Bai**. A rational radial basis function method for accurately resolving discontinuities and steep gradients. *Applied Numerical Mathematics*, 130:131–142, 2018

*These authors contributed equally to this work

Presentations

- SIAM Conference on Mathematics of Data Science (MDS24) (upcoming) 2024
- Conference on Computer Vision and Pattern Recognition 2023
- Southeastern Analysis Meeting 39 2023
- Korea Institute For Advanced Study (KIAS) AI seminar 2023
- International Conference on Machine Learning 2023

External Service

Conference Reviewer

- IEEE Information Theory Workshop 2024
- IEEE International Symposium on Information Theory 2024
- IEEE International Symposium on Information Theory 2023
- IEEE International Symposium on Information Theory 2022

Journal Reviewer

- Sampling Theory, Signal Processing, and Data Analysis 2024
- Computer Vision and Image Understanding 2024
- IEEE Signal Processing Letters 2024
- IEEE Signal Processing Letters 2023
- IEEE Transactions on Circuits and Systems for Video Technology 2023

Membership

- CVF Sponsored Conferences 2023
- IEEE member 2022