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Yikun Bai

Research Interests

- Computational Optimal Transport
- Machine Learning: Generative Models, Manifold Learning, Rigid/Non-Rigid Registration
- Information Theory: Measure Concentration, Generative Capacity Analysis

Education

Ph.D. Electrical and Computer Engineering 2019 - 2022
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 and related theoretical works for various Optimal Transport (OT) problems, including Unbalanced OT, Linear/sliced OT, and unbalanced Gromov-Wasserstein, etc.
  - Contributor to PythonOT package, which is the most widely used open-source computational optimal transport library.
  - **Achievements:**
    * Lead author of research papers published at CVPR 2023, ICML 2023, ICLR 2024.
    * Co-lead author of research papers presented at the NeurIPS OT Workshop 2023, ICLR 2023, ICML 2024, Neural Networks 2024, ICLR 2024.

- **University of Delaware** 2019 - 2021
  Research Assistant Newark, DE
  - Led theoretical studies exploring connections between entropic OT and measure concentration theory.
  - Co-led research on the generalized capacity of entropic OT in generative adversarial networks (GANs).
  - **Achievements:**
    * First 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

- Huy Tran*, **Yikun Bai***, Ashkan Shahbazi, John R Hershey, and Soheil Kolouri. Understanding learning with sliced-wasserstein requires rethinking informative slices. *arXiv preprint arXiv:2411.10651*, 2024

Conference

- Xinran Liu, **Yikun Bai**, Rocío Díaz Martín, Kaiwen Shi, Ashkan Shahbazi, Bennett A Landman, Catie Chang, and Soheil Kolouri. Linear spherical sliced optimal transport: A fast metric for comparing spherical data. *International Conference on Learning Representations (ICLR)*, 2024
- **Yikun Bai**, Abihith Kothapalli, Hengrong Du, Rocio Diaz Martin, and Soheil Kolouri. Linear partial gromov-wasserstein embedding. *International Conference on Learning Representations (ICLR)*, 2024
- Xinran Liu, Rocío Díaz Martín, **Yikun Bai**, Ashkan Shahbazi, Matthew Thorpe, Akram Aldroubi, and Soheil Kolouri. Expected sliced transport plans. *International Conference on Learning Representations (ICLR)*, 2024
- **Yikun Bai**, Rocio Diaz Martin, Hengrong Du, Ashkan Shahbazi, and Soheil Kolouri. Partial gromov-wasserstein metric. *International Conference on Learning Representations (ICLR)*, 2024
- 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

*These authors contributed equally to this work

Journal

- **Yikun Bai**, Huy Tran, Steven B Damelin, and Soheil Kolouri. Partial transport for point-cloud registration. *Sampling Theory, Signal Processing, and Data Analysis (SaSiDa)*, 2024
- Xinran Liu, **Yikun Bai**, Yuzhe Lu, Andrea Soltoggio, and Soheil Kolouri. Wasserstein task embedding for measuring task similarities. *Neural Networks*, 2022
- 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

Presentations

- SIAM Conference on Mathematics of Data Science (MDS24) 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

- The International Conference on Learning Representations 2024
- Conference on Neural Information Processing Systems 2024
- Women in Data Science and Mathematics (WiSDM) Research Collaboration Workshop 2024
- IEEE Information Theory Workshop 2024
- IEEE International Symposium on Information Theory 2022,2023,2024
- Conference on Neural Information Processing Systems 2024
- International Conference on Pattern Recognition 2024

Journal Reviewer

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

Membership

- CVF Sponsored Conferences 2023
- IEEE member 2022