Yikun Bai

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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

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*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 Systemss	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