

Xinran Liu

Ph.D. candidate in Computer Science
Vanderbilt University School of Engineering

400 24th Ave S, #373
Nashville, TN 37240
xinran.liu@vanderbilt.edu

Research Interests

Themes Enhancing the efficiency and Robustness of Optimal Transport in Machine Learning
Methods Sliced Optimal Transport, Linear Optimal Transport and Partial Optimal Transport
Applications Medical imaging, earth science, point-cloud analysis, shape matching and transfer learning

Education

2022 – **Vanderbilt University**, Ph.D. in Computer Science

- o Area: Optimal Transport, Machine Learning
- o Advisor: Soheil Kolouri
- o Committee: Soheil Kolouri, Akram Aldroubi, Alan Peters, Catie Chang, Daniel Moyer

2019 – 2021 **Vanderbilt University**, M.S. in Mathematics

2015 – 2019 **Chongqing University**, B.S. in Mathematics

- o Thesis: Persistent homology and applications in data science

Selected Publications

- 2025 **Liu, X.**, Bai, Y., Lu, Y., Soltoggio, A. and Kolouri, S. Wasserstein task embedding for measuring task similarities. *Neural Networks*, 181, 106796.
- 2024 **Liu, X.**, Bai, Y., Martín, R.D., Shi, K., Shahbazi, A., Landman, B.A., Chang, C. and Kolouri, S. Linear Spherical Sliced Optimal Transport: A Fast Metric for Comparing Spherical Data. In: The Thirteenth International Conference on Learning Representations (ICLR)
- 2024 **Liu, X.**, Martín, R.D., Bai, Y., Shahbazi, A., Thorpe, M., Aldroubi, A. and Kolouri, S. Expected sliced transport plans. In: The Thirteenth International Conference on Learning Representations (ICLR).
- 2024 Lu, Y.*, **Liu, X.***, Soltoggio, A. and Kolouri, S. Slosh: Set locality sensitive hashing via sliced-wasserstein embeddings. In: *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision* (pp. 2566-2576).
- 2023 Diaz Martin, R., Medri, I., Bai, Y., **Liu, X.**, Yan, K., Rohde, G.K. and Kolouri, S. LCOT: Linear circular optimal transport. In: The Twelfth International Conference on Learning Representations (ICLR)

Teaching

2025 Co-Instructor (upcoming), **CS 5262: Foundations of Machine Learning**, VU

2024 Teaching Assistant, **CS 8395-03: Machine Learning for Dynamical Systems**, VU

2023 Teaching Assistant, **CS 8395-02: Statistical Foundations of Deep Learning**, VU

2020 – 2021 Teaching Assistant, **MATH 1301: Accelerated Single-Variable Calculus II**, VU

Professional Activities and Service

Reviewer NeurIPS, ICML, ICLR

AI scholar Vanderbilt Lab for Immersive AI Translation (VALIANT)

Talks

- ‘Optimal Transport in Learning Set-Structured Data’
 - o Women in Data Science Conference. Data Science Institute at Vanderbilt, March 2023

Full List of Publications

Most recent publications via [Google Scholar](#).

Preprints

- 2025 Nath, S., Peridis, C., Benjamin, E., **Liu, X.**, Kolouri, S., Kinnell, P., Li, Z., Liu, C., Dora, S. and Soltoggio, A. Collaborative Learning in Agentic Systems: A Collective AI is Greater Than the Sum of Its Parts. *arXiv preprint arXiv:2506.05577*.
- 2025 NaderiAlizadeh, N., Salehi, D., **Liu, X.** and Kolouri, S. Constrained Sliced Wasserstein Embedding. *arXiv preprint arXiv:2506.02203*.
- 2025 Bai, Y., Tran, H., Du, H., **Liu, X.** and Kolouri, S. Fused Partial Gromov-Wasserstein for Structured Objects. *arXiv preprint arXiv:2502.09934*.

Conference and Journal Publications

- 2025 **Liu, X.**, Bai, Y., Lu, Y., Soltoggio, A., & Kolouri, S. Wasserstein task embedding for measuring task similarities. *Neural Networks*, 181, 106796.
- 2025 Shahbazi, A., Akbari, E., Salehi, D., **Liu, X.**, Naderializadeh, N. and Kolouri, S. ESPFormer: Doubly-Stochastic Attention with Expected Sliced Transport Plans. In: The Forty-Second International Conference on Machine Learning (ICML)
- 2024 Soltoggio, A., Ben-Iwhiwhu, E., Braverman, V., Eaton, E., Epstein, B., Ge, Y., Halperin, L., How, J., Itti, L., Jacobs, M.A. and Kantharaju, P., **Liu, X.** ... A collective AI via lifelong learning and sharing at the edge. *Nature Machine Intelligence*, 6(3), pp.251-264.
- 2024 **Liu, X.**, Bai, Y., Martín, R.D., Shi, K., Shahbazi, A., Landman, B.A., Chang, C. and Kolouri, S. Linear Spherical Sliced Optimal Transport: A Fast Metric for Comparing Spherical Data. In: The Thirteenth International Conference on Learning Representations (ICLR)
- 2024 **Liu, X.**, Martín, R.D., Bai, Y., Shahbazi, A., Thorpe, M., Aldroubi, A. and Kolouri, S. Expected sliced transport plans. In: The Thirteenth International Conference on Learning Representations (ICLR).
- 2024 Bai, Y., Martin, R.D., Kothapalli, A., Du, H., **Liu, X.** and Kolouri, S. Partial Gromov-Wasserstein Metric. In: The Thirteenth International Conference on Learning Representations (ICLR).
- 2024 Tran, H., Bai, Y., Kothapalli, A., Shahbazi, A., **Liu, X.**, Martin, R.P.D. and Kolouri, S. Stereographic Spherical Sliced Wasserstein Distances. In: The Forty-First International Conference on Machine Learning (ICML)
- 2024 **Liu, X.**, Lu, Y., Abbasi, A., Li, M., Mohammadi, J. and Kolouri, S. Teaching networks to solve optimization problems. *IEEE Access*, 12, pp.17102-17113.
- 2024 Lu, Y.*, **Liu, X.***, Soltoggio, A. and Kolouri, S. Slosh: Set locality sensitive hashing via sliced-wasserstein embeddings. In: *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision* (pp. 2566-2576).

- 2023 Nath, S., Peridis, C., Ben-Iwhiwhu, E., **Liu, X.**, Dora, S., Liu, C., Kolouri, S. and Soltoggio, A. Sharing lifelong reinforcement learning knowledge via modulating masks. In: *Conference on Lifelong Learning Agents* (pp. 936-960). PMLR..
- 2023 Diaz Martin, R., Medri, I., Bai, Y., **Liu, X.**, Yan, K., Rohde, G.K. and Kolouri, S. LCOT: Linear circular optimal transport. In: The Twelfth International Conference on Learning Representations (ICLR)

Refereed Workshop Contributions

- 2024 Kothapalli, A., Shahbazi, A., **Liu, X.**, Sheng, R. and Kolouri, S., Equivariant vs. Invariant Layers: A Comparison of Backbone and Pooling for Point Cloud Classification. In: *ICML 2024 Workshop on Geometry-grounded Representation Learning and Generative Modeling*.
- 2023 **Liu, X.**, Bai, Y., Tran, H., Zhu, Z., Thorpe, M. and Kolouri, S., PTLP: Partial Transport LP Distances. In: *NeurIPS 2023 Workshop Optimal Transport and Machine Learning*.

Professional Training

- July 2025 **Optimal Transport Summer School**, University of California, Santa Barbara, US
- June 2022 **Summer School on Optimal Transport**, Pacific Institute for the Mathematical Sciences, Seattle, US
- July 2018 **The 1st International Undergraduate Mathematics Summer School**, Peking University, Beijing, China

Professional Memberships

AMS (2019–), IEEE (2022–)