Alexander Tong

Université de Montréal; Mila
Dept. of Computer Science
and Operations Research
6666 Rue St-Urbain #200
Montréal, QC H2S 3H1, Canada

Phone: +1 (206) 902 6479
Email: alexander.tong@mila.quebec
Website: https://alextong.net
Github: https://github.com/atong01
Updated: April 11, 2022

Education

2021–	Postdoc, UdeM; Mila. Supervisor: Yoshua Bengio.
2017–2021	PhD in Computer Science, Yale University. Advisor: Smita Krishnaswamy.
	Graph Priors, Optimal Transport, and Deep Learning in Biomedical Discovery
	Thesis committee: Ronald Coifman, Guy Wolf, and James Aspnes
2015–2017	MS in Computer Science, Tufts University. Advisor: Soha Hassoun.
2013–2017	BS in Computer Science, Tufts University. (*summa cum laude*).

Preprints

[*] [†] Denote equal contribution.
Links to full publications available on my website: https://alextong.net/publications

[1] Huguet G.[*], **Tong A.**[*], Rieck B.[*], Huang J.[*], Kuchroo M., Hirn M.[†], Wolf G.[†], & Krishnaswamy S.[†] *Time-inhomogenous diffusion geometry and topology.* ArXiv (2022).

Publications

[1] **Tong A.**[*], Huguet G.[*], Shung D.[*], Natik A., Kuchroo M., Lajoie G., Wolf G.[†], Krishnaswamy S[†]. *Embedding Signals on Knowledge Graphs with Unbalanced Diffusion Earth Mover's Distance.* to appear ICASSP (2022).

[2] Kuchroo, M.[*], Huang, J.[*], Wong, P.[*], Grenier, J.-C., Shung, D., **Tong, A.**, Lucas, C., Klein, J., Burkhardt, D., Gigante, S., Godavarthi, A., Israelow, B., Oh, J. E., Silva, J., Takahashi, T., Odio, C. D., Fournier, J., Cruz, D., Ko, A. I., Wilson, F. P., Hussin, J., Wolf, G. & Krishnaswamy, S. *Multiscale PHATE Exploration of SARS-CoV-2 Data Reveals Multimodal Signatures of Disease.* in Nature Biotechnology (2022).

[3] Gerasimiuk, M.[*], Shung, D.[*], **Tong, A.**, Stanley, A., Schultz, M., Ngu, J., Laine, L., Wolf, G.[†] & Krishnaswamy, S.[†] MURAL: An unsupervised random forest-based embedding for electronic health record data. in 2021 IEEE International Conference on Big Data (Big Data) (2021).

[4] **Tong, A.**, Wolf, G. & Krishnaswamy, S. *Fixing Bias in Reconstruction-based Anomaly Detection with Lipschitz Discriminators.* in Journal of Signal Processing Systems (2021).

[5] Luecken, M. D.[*], Burkhardt, D. B.[*], Cannoodt, R.[*], Lance, C.[*], Agrawal, A., Aliee, H., Chen, A. T., Deconinck, L., Detweiler, A. M., Granados, A., Huynh, S., Isacco, L., Kim, Y. J., Kuppasani, S., Lickert, H., McGeever, A., Mekonen, H., Caceres, J., Morri, M., Mueller, M., Neff, N. F., Paul, S., Schneider, K., Steelman, S., Sterr, M., Treacy, D. J., **Tong, A.**, Villani, A.-C., Wang, G., Yan, J., Zhang, C., Pisco, A. O., Theis, F. J. & Bloom, J. M. *A sandbox for prediction and integration of DNA, RNA, and protein data in single cells.* in NeurIPS Datasets and Benchmarks Track (2021).

[6] **Tong, A.**[*], Wenkel, F.[*], MacDonald, K. Krishnaswamy S.[†] & Wolf, G.[†] *Data-driven Learning of Geometric Scattering Modules for GNNs.* in IEEE MLSP (2021).

[7] Kuchroo, M.*, Godavarthi A.*, **Tong, A.** Wolf, G.†, & Krishnaswamy S†. *Multimodal data visualization and denoising with integrated diffusion.* in IEEE MLSP (2021).

[8] **Tong, A.***, Huguet, G.*, Natik, A.*, MacDonald, K., Kuchroo, M., Coifman, R., Wolf, G.† & Krishnaswamy, S.† *Diffusion Earth Mover's Distance and Distribution Embeddings.* in Proceedings of the 38th International Conference of Machine Learning (2021).

[9] Flamary, R., Courty, N., Gramfort, A., Alaya, M. Z., Boisbunon, A., Chambon, S., Chapel, L., Corenflos, A., Fatras, K., Fournier, N., Gautheron, L., Gayraud, N. T. H., Janati, H., Rakotomamonjy, A., Redko, I., Rolet, A., Schutz, A., Seguy, V., Sutherland, D. J., Tavenard, R., **Tong, A**. & Vayer, T. *POT: Python Optimal Transport.* JMLR 22, (2021).

[10] Burkhardt, D. B.*, Stanley, J. S.*, **Tong, A.**, Perdigoto, A. L., Gigante, S. A., Herold, K. C., Wolf, G., Giraldez, A. J.†, van Dijk, D.†, & Krishnaswamy, S.† *Quantifying the Effect of Experimental Perturbations in Single-Cell RNA-Sequencing Data Using Graph Signal Processing.* Nat. Biotech. (2021). doi:10.1101/532846

[11] Castro, E., Benz, A., **Tong, A.**, Wolf, G.†, & Krishnaswamy, S.† *Uncovering the Folding Landscape of RNA Secondary Structure with Deep Graph Embeddings.* in 2020 IEEE International Conference on Big Data (2020).

[12] **Tong, A.**, Wolf, G. & Krishnaswamy, S. *Fixing Bias in Reconstruction-based Anomaly Detection with Lipschitz Discriminators.* in IEEE MLSP (2020). **Best Student Paper Award**

[13] **Tong, A.**, Huang, J., Wolf, G.†, van Dijk, D.† & Krishnaswamy, S.† *TrajectoryNet: A Dynamic Optimal Transport Network for Modeling Cellular Dynamics.* in Proceedings of the 37th International Conference on Machine Learning (2020).

[14] Dijk, D. van*, Burkhardt, D. B.*, Amodio, M., **Tong, A.**, Wolf, G.† & Krishnaswamy, S.† *Finding Archetypal Spaces Using Neural Networks.* in 2019 IEEE International Conference on Big Data (Big Data) 2634–2643 (IEEE, 2019). doi:10.1109/BigData47090.2019.9006484

[15] **Tong, A.***, van Dijk, D.*, Stanley III, J. S., Amodio, M., Yim, K., Muhle, R., Noonan, J., Wolf, G.† & Krishnaswamy, S.† *Interpretable Neuron Structuring with Graph Spectral Regularization.* in Advances in Intelligent Data Analysis XVIII 509–521 (Springer International Publishing, 2020). doi:10.1007/978-3-030-44584-3_40

[16] Aspnes, J., Haeupler, B., **Tong, A.** & Woelfel, P. *Allocate-On-Use Space Complexity of Shared-Memory Algorithms.* (2018). doi:10.4230/LIPICS.DISC.2018.8 (Note: authors ordered alphabetically)

Workshops & other presentations

[1] **Tong, A.** *Graph Priors, Optimal Transport, and Deep Learning in Biomedical Discovery* Ph.D. Dissertation (2021)

[2] Kuchroo M.*, Godavarthi A.*, **Tong, A.**, Wolf G., Krishnaswamy S. *Multimodal data visualization, denoising, and clustering with Integrated Diffusion* ICML 2021 Workshop on Computational Biology.

[3] Venkat A., Miyagishima D. **Tong A.**, Günel M., Krishnaswamy S. *Manifold-based gene density estimates reveal immune signaling in meningioma tumors.* 29th Conference on Intelligent Systems for Molecular Biology (2021).

[4] **Tong, A.**, San Juan B., Kuchroo, M., Zhu B., Chaffer C., & Krishnaswamy S. *Understanding the mesenchymal-to-epithelial transition and its drivers in triple-negative breast cancer with continuous normalizing flows.* American Association of Cancer Research (AACR) 2021.

[5] **Tong, A.**, Kuchroo, M., Huguet G., Coifman R., Wolf G., Krishnaswamy S., *Fast Diffusion Optimal Transport for Manifold-of-Manifold Embeddings.* NeurIPS 2020 Workshop on Learning Meaningful Representations of Life.

[6] **Tong, A.**[*], Wenkel, F.[*], MacDonald, K. Krishnaswamy S.[†] & Wolf, G.[†] *Data driven learning of deep scattering networks.* NeurIPS 2020 Machine Learning for Molecules Workshop

[7] **Tong, A.** & Krishnaswamy, S. *Interpolating optimal transport barycenters of patient manifolds.* 28th Conference on Intelligent Systems for Molecular Biology (2020).

[8] Castro, E., Benz, A., **Tong, A.**, Wolf, G. & Krishnaswamy, S. *Uncovering the Folding Landscape of RNA Secondary Structure with Deep Graph Embeddings.* ICML 2020 Workshop on Graph Representation Learning and Beyond.

[9] **Tong, A.**[*], Wenkel, F.[*], MacDonald K., Wolf, G.[†] & Krishnaswamy, S.[†] *Scattering Priors for Graph Neural Networks. In Conference on the Mathematical Theory of Deep Learning.* (2020).

[10] **Tong, A.**, Huang, J., Wolf, G.[†], van Dijk, D.[†] & Krishnaswamy, S.[†] *Modeling Cellular Dynamics with Continuous Normalizing Flows.* NeurIPS 2019 Workshop on Learning Meaningful Representations of Life. Spotlight presentation.

[11] **Tong, A.**[*], van Dijk, D.[*], Stanley III, J. S., Amodio, M., Yim, K., Muhle, R., Noonan, J., Wolf, G.[†] & Krishnaswamy, S.[†] *Graph Spectral Regularization For Neural Network Interpretability.* Presented at the Workshop on Representation Learning on Graphs and Manifolds (ICLR 2019). Poster.

Honors

Best Student Paper IEEE Machine Learning and Signal Processing 2020
Qualified with distinction 2019
Tau Beta Pi Honor Society 2016
3x Academic All-American ICSA

Experience

Mila—Quebec AI Institute, Montreal, CA (virtual)
Visiting Researcher, Fall 2020

- Collaboration with Guy Wolf on geometric scattering

Artificial Intelligence Laboratory, Xevo Inc., Bellevue, WA
AI Research Intern, Summer 2017

- Productized object detection algorithms for use in automotive computer vision systems
- Improved embedded high-performance, low-power machine learning framework

Ab Initio, Lexington, MA
Software Engineering Intern, Summer 2016

- Integrated statistics tracking into Hadoop Map-reduce multi-process environment
- Worked on meta-programming system to cross compile on multiple architectures

Amazon Robotics (formerly Kiva Systems), North Reading, MA
Software Engineering Intern, Summer 2015

- Developed a visual localization system to augment personnel tracking system
- Simultaneous Localization and Mapping (SLAM) system presented to CEO

Surround.io, Seattle, WA
Software Engineering Intern, Summer 2014

- Implemented Raspberry Pi based Hadoop Map-reduce cluster
- First intern in early stage startup with four senior software engineers