Aram-Alexandre Pooladian

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Education

PhD (Data Science: Theory track)

Focus: High-dimensional statistics, machine learning, and optimal transport *Advisor:* Jonathan Niles-Weed

Funding: Meta AI Mentorship, Google Research Collab, Data Science Fellowship, and NSERC PGS-D

MSc (Applied Mathematics)

 Focus: Optimization and Deep Learning
 May 2018 – N

 Advisors: Tim Hoheisel and Adam Oberman
 Funding: Lorne Trottier Fellowship, NSERC CGS-M, FRQNT Scholarship, Mitacs Scholarship

BA (Honours Applied Mathematics)

Honours thesis advisor: Tim Hoheisel

McGill University September 2014 – May 2018

Work experience

Visiting researcher

Mentors: Brandon Amos and Ricky Chen *Focus:* Computational aspects of optimal transport, generative modelling

Research articles

Preprints

- Kassraie, P., Pooladian, A.-A., Klein, M., Thornton, J., Niles-Weed, J., and Cuturi, M. "Progressive Entropic Optimal Transport Solvers", 2024 [arXiv] [PDF]
- Divol, V., Niles-Weed, J., and Pooladian, A-A. (alphabetical) "Tight stability of entropic Brenier maps", 2024 [arXiv] [PDF]
- Klein, M., Pooladian, A-A., Ndiaye, E., Ablin, P., Niles-Weed, J., and Cuturi, M. "Learning Costs for Structured Monge Displacements", 2023 [arXiv] [PDF]
- Divol, V., Niles-Weed, J., and **Pooladian, A-A.** (alphabetical) "Optimal transport map estimation in general function spaces", 2022 [arXiv] [PDF]
- Pooladian, A-A., and Niles-Weed, J. "Entropic estimation of optimal transport maps", 2021. [arXiv] [PDF]
 Best paper award at NeurIPS Workshop: Optimal Transport in Machine Learning (OTML), 2021

Journal publications

- Chewi, S., and **Pooladian**, **A-A.** (alphabetical) "An entropic generalization of Caffarelli's contraction theorem via covariance inequalities", 2024. *Compte Rendues Mathématique* [arXiv] [PDF]
- Domingo-Enrich, C., and Pooladian, A-A. (alphabetical) "An Explicit Expansion of the Kullback-Leibler Divergence along Fisher-Rao gradient flows", *Transactions on Machine Learning Research (TMLR)* 2023 [arXiv] [PDF]
- Hoheisel, T., Pablos, B., Pooladian A-A., Schwartz, A., and Steverango, L. (alphabetical) "A survey of one-parameter regularization methods for mathematical programs with vanishing constraints", *Optimization Methods and Software*.

McGill University *May* 2018 – *May* 2020

New York University

September 2020 – Present

nember 2014 – Muy 2018

Meta AI Research October 2022 – Present

Conference and workshop publications

- Jiang, Y., Chewi, S., Pooladian, A-A. (supervisory role) "Algorithms for mean-field variational inference via polyhedral optimization in the Wasserstein space", *Thirty-seventh Conference on Learning Theory* (COLT) 2024 (extended abstract). [arXiv] [PDF]
- **Pooladian, A-A.**, Domingo-Enrich, C., Chen, R., and Amos, B. "Neural Optimal Transport with Lagrangian Costs", *Fortieth International Conference on Uncertainty in Artificial Intelligence (UAI)* 2024. [PDF]
- Pooladian, A-A.*, Divol, V.*, and Niles-Weed, J. "Minimax estimation of discontinuous optimal transport maps: The semi-discrete case", *Fortieth International Conference on Machine Learning (ICML)* 2023. [arXiv] [PDF]
- Pooladian, A-A.*, Ben-Hamu, H.*, Domingo-Enrich, C.*, Amos, B., Lipman, Y., and Chen, R. "Multisample Flow Matching: Straightening Flows with Minibatch Couplings", *Fortieth International Conference on Machine Learning (ICML)* 2023. [arXiv] [PDF]
- **Pooladian, A-A.**, Cuturi M., and Niles-Weed, J. "Debiaser Beware: Pitfalls of Centering Regularized Transport Maps", *Thirty-nineth International Conference on Machine Learning (ICML)* 2022. [arXiv] [PDF]
- Finlay, C., Gerolin, A., Oberman, A., Pooladian, A-A. (alphabetical) "Learning normalizing flows from Entropy-Kantorovich potentials", *Invertible Neural Networks, Normalizing Flows, and Explicit Likelihood Models* (*INNF*+) *ICML Workshop*, 2020. [arXiv] [PDF] (Spotlight presentation)
- Pooladian, A-A., Finlay, C., Hoheisel, T., and Oberman, A. "A principled approach for generating adversarial images under non-smooth dissimiliarity metrics", *Proceedings of the 23rd International Conference on Artificial Intelligence and Statistics (AISTATS)*, 2020. [arXiv] [PDF]
- Finlay, C.*, **Pooladian, A-A.***, and Oberman, A. "The LogBarrier attack: making effective use of decision boundary information ", *IEEE International Conference on Computer Vision (ICCV)*, 2019. [PDF]

Select awards and scholarships

Meta AI Mentorship fellowship (Mentored by Brandon Amos and Ricky Competitive industry scholarship: full tuition and stipend covered for two academ	Chen) Oct 2022 — Oct 2024 nic years
Best Paper Award at NeurIPS OTML Workshop	Dec 2021
Google Research Collab Award (With Marco Cuturi) Competitive scholarship in collaboration with industry	Fall 2021
NSERC CGS-D Scholarship (Declined; accepted PGS-D Scholarship) Competitive Canadian scholarship; awarded to roughly 17% of applicants	May 2020 — May 2023
IPAM Research Fellow at UCLA	March 2020 — June 2020
Mitacs Scholarship with Desjardins Competitive scholarship in collaboration with industry	September 2019 — December 2019
FRQNT Master's Scholarship Competitive provincial master's scholarship; ranked 2 nd in my category	May 2019 — May 2020
Lorne Trottier Fellowship Nominated by faculty	May 2018 — May 2019
NSERC CGS-M Scholarship Competitive Canadian scholarship; awarded to 3 students in the department	May 2018 — May 2019

Invited talks and presentations

Physics of AI Algorithms	January 2025
Invited talk: Workshop on optimization, artificial intelligence, and physics	Les Houches, France
Learning and Optimization in Luminy 2024	June 2024
<i>Invited talk:</i> Workshop on optimization, distributed learning, and optimal transport	Marseilles, France
Institute for Scientific Studies in Cargese	April 2024
<i>Invited talk:</i> Workshop on optimal transport	Corsica, France
Eidgenössische Technische Hochschule (ETH) Zürich	March 2024
Seminar talk: DACO Seminar	Zurich, Switzerland
École Polytechnique Fédérale de Lausanne (EPFL)	March 2024
Seminar talk: FLAIR Seminar	Lausanne, Switzerland
Bocconi University	March 2024
Informal seminar speaker	Milan, Italy
SIAM Uncertainty Quantification 2024	February 2024
<i>Invited talk:</i> Workshop on computational transport	Trieste, Italy
International Conference on Statistics and Data Science	December 2023
<i>Invited talk (replacement) and contributing talk</i>	Lisbon, Portugal
16th International Conference on Computational and Methodological Statistics	December 2023
Invited talk: Workshop on optimal transport and statistics	Berlin, Germany
Massachusetts Institute of Technology	December 2023
Invited seminar speaker	Cambridge, MA, USA
Foundations of Computational Mathematics	June 2023
Invited talk: Workshop on computational optimal transport	Paris, France
University of Ottawa	March 2023
Invited seminar speaker	Ottawa, Canada
University of Toronto (Vector Institute)	March 2023
Invited seminar speaker	Toronto, Canada
Simons Institute for the Theory of Computing	January 2023
Invited talk: Geometric Methods in Optimization and Sampling Reunion Workshop	Berkeley, CA, USA
Yale University	April 2022
Invited seminar speaker	New Haven, CT, USA
MIT-IBM-Cornell joint meeting	March 2022
Invited seminar speaker	(Online)
Optimal Transport & Machine Learning Workshop at NeurIPS (Best Paper Award) December 2021
Contributing talk: Oral presentation	(Online)
Simons Institute for the Theory of Computing	December 2021
Invited talk: Geometric Methods in Optimization and Sampling	Berkeley, CA, USA
Invertible Neural Nets and Normalizing Flows Workshop at ICML	July 2020
Contributing talk: Oral presentation	(Online)

Students supervised

Yiheng Zhang (Undergraduate student) *Outcome:* Paper accepted at Conference on Learning Theory (COLT) 2024 New York University *Summer and Fall 2022*

Academic service and other activities

• Co-organizer of Optimal Transport and Machine Learning (OTML) Workshop at NeurIPS 2023

• Journal reviewing: Annals of Statistics, Annales de l'Institut Henri Poincaré Bernoulli, Journal of Machine

Learning Research, Research in Mathematical Sciences, SIAM Journal of Uncertainty Quantification

- Conference reviewing: Interational Conference on Machine Learning (ICML 2022, 2023), NeurIPS 2023, NeurIPS OTML workshop (2021, 2023), Conference on Learning Theory (COLT 2021, 2022, 2023), International Conference on Artificial Intelligence and Statistics (AISTATS 2021, 2023)
- Organizer and founder of the CDS Graduate Student Seminar Series (Spring 2022, Fall 2022, Spring 2023)
- PhD Student Representative at NYU CDS (2020 2021)

Teaching experience

Head Teaching Assistant for "DSGA 1020: Mathematical Statistics" (Grad course)	New York University
Prepared weekly tutorials, marked assignments and exams	Fall 2022
Course Instructor for "Girls in STEM: Data Science"	New York University
Prepared and delivered over 20h of material to \sim 40 high school girls across 5 weeks	Summer 2021, 2022
Head Teaching Assistant for "MATH 151: Calculus A" (Undergrad course)	McGill University
Prepared weekly tutorials and held office hours	Fall 2018