Beheshteh Toloueirakhshan

Curriculum Vitae

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Research interests: Algorithms & Theory of Machine Learning, Randomized Numerical Linear Algebra, Tensor Decomposition Methods and Quantum Computing

Education

Jan. 2021- Now **PhD, Computer Science,** Mila / University of Montreal, Department of Computer Science and Operations Research, Montreal, QC, Canada, GPA: 4.3/4.3.
Advisor: Guillaume Rabusseau
Thesis: "Sampling-based tensor decompositions methods with applications in Machine Learning."

Aug. 2016- Apr. 2019 **MSc, Applied Mathematics,** Purdue University, Department of Mathematics, West Lafayette, IN, USA.

Sept. 2010- Oct. 2012 **MSc, Applied Mathematics,** Amirkabir University of Technology, Department of Mathematics and Computer Science, Tehran, Iran.
Thesis: "Wavelet-based Multilevel method for linear ill-posed problems"

Sept. 2006- July 2010 **BSc, Applied Mathematics,** Shahid Beheshti University, Department of Mathematical sciences, Tehran, Iran.

Research Experience

Aug. 2024- Oct. 2024 **Quantum Machine Learning Intern,** Zapata AI.
Mentor: Jing Chen

- Parameterizing high-order integrals in the tensor train format for high-performance computing applications in finance.

Jan. 2020- Dec. 2020 **Visiting Researcher,** Mila, Montreal, QC, Canada.
Mentor: Guillaume Rabusseau

- Navigating a fast low-rank approximation algorithm for matrices given in the Tensor Train format.

May 2019- Jan. 2020 **Research Intern,** Mila, Montreal, Canada.
Mentor: Guillaume Rabusseau

- Introduced a novel random projection technique for efficiently reducing the dimension of very high-dimensional data.
- Proposed two tensorized random projection maps relying on the Tensor Train and CP decomposition formats.

Publications

- **Efficient Leverage Score Sampling for Tensor Train Decomposition.**
  Vivek Bharadwaj*, **Beheshteh T. Rakhshan***, Osman Asif Malik, Guillaume Rabusseau
  38th Conference on Neural Information Processing Systems (NeurIPS 2024).
  `https://arxiv.org/pdf/2406.02749` (* Equal contribution).
- **Rademacher Random Projections with Tensor Networks.**
  Beheshteh T. Rakhshan, Guillaume Rabusseau
  Second Workshop on Quantum Tensor Networks in Machine Learning. In conjunction with 35th NeurIPS, 2021.
  `https://arxiv.org/pdf/2110.13970`

- **Tensorized Random Projections.**
  Beheshteh T. Rakhshan, Guillaume Rabusseau
  Proceedings of the 23rd International Conference on Artificial Intelligence and Statistics (AISTATS) 2020, pages 3306–3316, Palermo, Italy.
  `http://proceedings.mlr.press/v108/rakhshan20a.html`

Talks

- **Tensorized Random Projections.**
  Proceedings of the 23rd International Conference on Artificial Intelligence and Statistics (AISTATS), Virtual, August 2020.
  `https://slideslive.com/38930252`
- **Rademacher Random Projections with Tensor Networks**
  Second Workshop on Quantum Tensor Networks in Machine Learning. In conjunction with 35th NeurIPS, Virtual, Dec 2021.
  `https://slideslive.com/38971501`
- **When Randomized Algorithms Meet Tensor Decompositions**
  Mila tensor networks reading group.
  `https://www.youtube.com/watch?v=_ArtT2W8SHY&t=423s`
- **Efficient Leverage Score Sampling for Tensor Train Decomposition.**
  38th Conference on Neural Information Processing Systems (NeurIPS 2024), Vancouver, Dec. 2024.

Honors & Awards

2024 **Selected to participate at the 2024 Gene Golub SIAM summer school**.
Full travel support for the summer school in Quito, Ecuador.

2022 **Professor Kyunghyun Cho Diversity Award**.
$1500 to empower female PhD students in AI from under-represented countries

2021 **IVADO PhD Excellence Scholarship**.
Competitive $25'000/year Ph.D. scholarship based on grades and research proposal, renewable for three years.

2021 **Tuition Exemption Scholarship,** Mila / University of Montreal, Department of Computer Science and Operations Research, Montreal, QC, Canada.
Graduate tuition exemption based on the GPA.

2020 **Microsoft Diversity Award for Doctoral Research**.
$6000 awarded for encouraging underrepresented AI researchers.

2020 **Mitacs Globalink Research Award,** Montreal, QC, Canada.
$6000 to conduct 12–24-week research project at Mila.

2019 **Joint Mathematics Meeting (JMM) Conference Travel Award,** Baltimore, USA.
$1000 for travelling to JMM 2019.

2010 **Entered Graduate Program in Applied Mathematics without taking the National Entrance Exam,** Department of Mathematics and Computer Science, Amirkabir University of Technology, Tehran, Iran.
As a reward of achieving the Second GPA-based place in the class of 2010 BSc.

Leadership & Service

Sep 2023-Now **Mila Tensor Networks Reading Group**.
- Served as a co-organizer

Dec 2023 **New In ML workshop, NeurIPS 2023**.
- Served as a co-organizer

Nov 2022- Nov 2023 **Mila LapReps,** worked as Students Representative.
- Co-organized visit day for Mila Graduate Admissions
- Organized town halls
- Co-organized Deep Learning and Reinforcement Learning (DLRL) summer school
- Equity, Diversity, Inclusion (EDI) committee member
- Co-organized Mila new cohort students' welcome session

Dec 2022- Dec 2024 **Mila MSc and PhD supervision applications reviewer**.
- Evaluated applications from students seeking funded research positions at Mila for continuing grad study.

May 2019- Sep 2022 **Organizer for the Tensor & Linear Algebra Group Meetings,** Mila.
Head: Guillaume Rabusseau

2018-2019 **Association for Women in Purdue, Purdue AWM chapter,** Cabinet Member and Secretary, Department of Mathematics, Purdue University.
- Organized informal chats, social gatherings and dinners with guest speakers
- Organized mentoring program to help first year graduate students
- Organized basic skills workshops to build a network among the women in mathematics

2018 **Purdue Iranian Cultural Club, ICC,** Served as a Treasurer.
- Prepared proposals to apply for funding to hold Persian events
- helped Iranian first year students by organizing orientations

Teaching Experience

Winter 2022 **Matrix and tensor factorization techniques for machine learning course,** Mila.
Guest Lecturer: Dimension reduction techniques in tensor decompositions

Fall 2016 **Analytic Geometry And Calculus I,** Department of Mathematics, Purdue University.
Teaching Assistant: Prepared homework solutions, graded quizzes and solved students homework problems.

Spring 2017- Fall 2018 **Topics in Vector Calculus, Elements of Algebra,** Department of Mathematics, Purdue University.
Graded students weekly homework.

Spring 2019 **Analytic Geometry And Calculus II,** Department of Mathematics, Purdue University.
Teaching Assistant: Prepared homework solutions, graded quizzes, and solved student homework problems.

Summer 2019 **Differential Equations and Partial Differential Equations for Engineering and the Sciences,** Department of Mathematics, Purdue University.
Online Teaching Assistant: Solved student homework problems on Piazza.

Skills

Programming

LaTeX, Python, Matlab

ML libraries

PyTorch, Sklearn, TensorFlow

Spoken

English (Fluent), Persian (Native), French (Intermediate)

Work Experience

2013-2015 **Pasargad Bank,** Tehran, Iran.
Teller
- Provided account services to customers by receiving deposits and loan payments
- cashed checks and issuing savings withdrawals
- Informed customers of new services and product promotions; ascertaining customers' needs; directing customers to a branch representative

2013 **National Organization for Development of Exceptional Talents (NODET) & Salam Sabz high schools,** Tehran, Iran.

Mathematics Teacher

- Prepared subjects on high school calculus, Solved students' issues on homework problems
- Graded their exams

2010-2015 **Mathematics Tutor, self-employed,** Tehran, Iran.

- Tutored as a private math teacher and taught high school students and college freshmen