Andrew Cheng

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Education

Harvard University   **Supervised by Yue Lu & Adit Radhakrishnan (MIT)**
PhD Computer Science (Optimization, Statistical Learning, Machine Learning)   Expected 2027
  – NSERC CGS-D PhD Fellowship: $120k

McGill University & MILA   **Supervised by Courtney and Elliot Paquette**
Thesis-Based Master's in Mathematics (Optimization & Machine Learning)   2023
  – **cGPA: 4.00/4.00 | Coursework:** Advanced Probability 1 & 2, Random Matrix Theory, Convex Optimization, High-Dimensional Probability
  – Graduate Excellence Scholarship (MILA): $30,000 | FQRNT Scholarship: $17,500 | MITACS Scholarship: $30,000

McGill University
BSc. Joint Honours Statistics and Computer Science & Minor in Physics   2021
  – **cGPA: 3.80 | Major GPA: 3.90**
  – **Master's coursework:** Time Series Analysis; Sampling Theory; Matrix Computations; Honours Linear Regression; Generalized Linear Models; Applied Machine Learning
  – **PhD-level coursework:** Mathematical Techniques in Machine Learning; Computation Intensive Statistics; Probabilistic Analysis of Algorithms (achieved highest grade in all 9 graduate courses during undergrad)

Publications & Preprints

1. K. Lee, **A. Cheng**, E. Paquette, and C. Paquette. Trajectory of mini-batch momentum: Batch size saturation and convergence in high dimensions. In S. Koyejo, S. Mohamed, A. Agarwal, D. Belgrave, K. Cho, and A. Oh, editors, Advances in Neural Information Processing Systems, volume 35, pages 36944-36957. Curran Associates, Inc., 2022.URL

2. **A. Cheng** and M. Weber. Structured regularization for spd optimization with side information. In *2024 60-th Annual Allerton Conference on Communication, Control, and Computing*, pages $1 - 8, 2024$.
   IEEE: https://ieeexplore.ieee.org/abstract/document/10735290

3. **A. Cheng**, K. Lee, C. Paquette. Exact Dynamics of First Order Stochastic Algorithms in High-Dimensions (2024) (accepted to NeurIPS 2024 MLOPT workshop Manuscript in preparation, 2025).

4. **A. Cheng**, M. Weber. *Structured Optimization on the PSD Riemannian Manifold* (2024) (accepted to NeurIPS 2024 MLOPT workshop and submitted to Mathematical Programming). https://arxiv.org/abs/2410.09660

5. **A. Cheng***, V. Dixit*, and M. Weber. Disciplined geodesically convex programming. (accepted with revision in Mathematical Programming (Comp.), 2025). https://arxiv.org/abs/2407.05261

6. **A. Cheng**, B. Kiani, A. Radhakrishnan, and M. Weber. Backpropagation-free Deep Feature Learning in Linear Structured Models. Manuscript in preparation, 2025.

Talks

1. Presented two workshop papers: *High Dimensional First Order Mini-Batch Algorithms* and *Structured Regularization on the SPD Manifold* at the NeurIPS 2024 MLOPT workshop

2. Presented the link between stochastic optimization of quadratic functions and polynomials to the Montreal Optimization Seminar (2021)

3. Presented at 2022 INFORMS Annual Meeting, NeurIPS 2022, and the Montreal Optimization Seminar

Work Experience

PhD Computing Scholar
Lawrence Livermore National Lab   May - December 2025
  – Developing interpretable machine learning algorithms for prediction of the stability of energy grids across the USA
  – Contract extended after initial internship

Deep Learning Researcher Intern
Valence Labs (Start-Up Acquired in June 2023)   May 2022 - July 2022 & June 2023 - August 2023
  – Designed unsupervised learning methods inspired by the notion of disentanglement to navigate the molecular space to generate novel molecular compounds
  – Applied transformers and variational autoencoders in PyTorch to molecular (NLP) data sets
  – Offer to continue working during PhD