Khai Nguyen

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Research Interest

My current works are making Optimal Transport scalable (low computational complexity, low memory complexity, low sample complexity) in Machine Learning. In particular, I investigate new dimension reduction methods via projections (sliced Wasserstein) and new sub-sampling methods (mini-batch Optimal Transport). On the application side, I am interested in utilizing Optimal Transport to improve generative models, Bayesian inference, domain adaptation, and other tasks that need to deal with probability measures. Besides Optimal Transport, I am interested in applying my proposed techniques to other statistical objectives such that Fisher divergence (used in Score-Based Diffusion models) and mutual information. Moreover, I am also interested in designing efficient Transformer architectures by considering statistical attention modules.

Experience

The Univeristy of Texas at Austin — Texas, USA
Graduate Research Assistant — September, 2022 –Present

- Research topics: Large-scale Optimal Transport in Machine Learning.

AT&T Labs — Texas, USA
Research Intern — June, 2022 –August, 2022

- Research topics: User Browsing Behavior Analysis, Co-clustering.
- Proposed and implemented clustering algorithms in PySpark on DataBricks.

VinAI Research — Hanoi, Vietnam
AI Research Resident — 2019 –2021

- Research topics: Deep Generative Models, Optimal Transport.
- Advisor: Dr. Hung Bui (Director of VinAI Research).
- Did research on Deep Generative Models (VAEs, GANs, Score matching models) and improved them with Optimal Transport (sliced Wasserstein distance, Sinkhorn divergence).

Data Science Laboratory (HUST) — Hanoi, Vietnam
Undergraduate Research Student — 2018–2020

- Research topics: Probabilistic Graphical Model, Continual Learning.
- Applied continual learning techniques to Variational Inference, maximum likelihood estimators, and so on.

Education

The University of Texas at Austin — Texas, USA
Ph.D. in Statistics at Department of Statistics and Data Sciences — 2021–Present

- Expected graduation date: June, 2026.
- GPA: 3.95/4.0.
- Advisors: Professor Nhat Ho.

Hanoi University of Science and Technology (HUST) — Hanoi, Vietnam
B.Sc in Computer Science (5 years program) — 2015–2020

- GPA: 3.61/4.00, Major GPA: 3.71/4.00, Top: 1%, graduated with Excellent Degree.
- Thesis: "Distributional Sliced-Wasserstein and Applications to Generative Modeling".

Publications

1. Revisiting Sliced Wasserstein on Images: From Vectorization to Convolution
***Khai Nguyen**, Nhat Ho*

- *PDF:* https://arxiv.org/abs/2204.01188.
- *Thirty-sixth Conference on Neural Information Processing Systems (NeurIPS 2022).*

2. Amortized Projection Optimization for Sliced Wasserstein Generative Models
***Khai Nguyen**, Nhat Ho*

- *PDF:* https://arxiv.org/abs/2203.13417.
- *Thirty-sixth Conference on Neural Information Processing Systems (NeurIPS 2022).*

3. Transformer with Fourier Integral Attentions
*Tan Nguyen, Minh Pham, Tam Nguyen, **Khai Nguyen**, Stanley Osher, Nhat Ho*

- *PDF:* https://arxiv.org/abs/2206.00206.
- *Thirty-sixth Conference on Neural Information Processing Systems (NeurIPS 2022).*

4. Improving Transformer with an Admixture of Attention Heads
*Tan Nguyen, Tam Nguyen, Hai Do, **Khai Nguyen**,*
Vishwanath Saragadam, Minh Pham, Khuong Nguyen, Nhat Ho, Stanley Osher

- *PDF:* To be appeared.
- *Thirty-sixth Conference on Neural Information Processing Systems (NeurIPS 2022).*

5. Improving Mini-batch Optimal Transport via Partial Transportation
***Khai Nguyen**, Dang Nguyen, Tung Pham, Nhat Ho*

- *PDF:* https://arxiv.org/abs/2108.09645.
- *International Conference on Machine Learning (ICML 2022).*

6. On Transportation of Mini-batches: A Hierarchical Approach
***Khai Nguyen**, Dang Nguyen, Quoc Nguyen, Tung Pham, Hung Bui, Dinh Phung, Trung Le, Nhat Ho*

- *PDF:* https://arxiv.org/abs/2102.05912.
- *International Conference on Machine Learning (ICML 2022).*

7. On Multimarginal Partial Optimal Transport: Equivalent Forms and Computational Complexity
*Huy Nguyen, Khang Le, **Khai Nguyen**, Tung Pham, Nhat Ho*

- *PDF:* https://proceedings.mlr.press/v151/le22a.html.
- *International Conference on Artificial Intelligence and Statistics (AISTATS 2022).*

8. Structured Dropout Variational Inference for Bayesian Neural Networks
*Son Nguyen, Duong Nguyen, **Khai Nguyen**, Khoat Than, Hung Bui, Nhat Ho*

- *PDF:* https://arxiv.org/abs/2102.07927.
- *Thirty-fifth Conference on Neural Information Processing Systems (NeurIPS 2021).*

9. Improving Relational Regularized Autoencoders with Spherical Sliced Fused Gromov Wasserstein
***Khai Nguyen**, Son Nguyen, Nhat Ho, Tung Pham, Hung Bui*

- *PDF:* https://arxiv.org/abs/2010.01787.
- *International Conference on Learning Representations (ICLR) 2021.*

10. Distributional Sliced-Wasserstein and Applications to Generative Modeling
***Khai Nguyen**, Nhat Ho, Tung Pham, Hung Bui*

- *PDF:* https://arxiv.org/abs/2002.07367.
- *International Conference on Learning Representations (ICLR) 2021 (Spotlight 3.8%).*

Submissions

11. Hierarchical Sliced Wasserstein Distances

***Khai Nguyen**, Tongzheng Ren, Huy Nguyen, Litu Rout, Tan Nguyen, Nhat Ho*

- *PDF:* https://arxiv.org/abs/2209.13570.
- *Under review.*

12. Model Fusion of Heterogeneous Neural Networks via Cross-Layer Alignment

*Dang Nguyen, **Khai Nguyen**, Dinh Phung, Hung Bui, Nhat Ho*

- *PDF:* https://arxiv.org/abs/2110.15538.
- *Under review.*

Professional services

- Reviewer at Journal of Machine Learning Research (JMLR).
- Reviewer at International Conference on Machine Learning (ICML) 2021, 2022.
- Reviewer at Conference on Neural Information Processing Systems (NeurIPS) 2021, 2022.
- Reviewer at Workshop on Deep Generative Models (NeurIPS) 2021.
- Reviewer at International Conference on Learning Representations (ICLR) 2022, 2023.
- Reviewer at International Conference on Artificial Intelligence and Statistics (AISTATS) 2022.
- Reviewer at AAAI Conference on Artificial Intelligence (AAAI) 2023.

Awards

- ICML Participation Grants (about 2,000$). 2022
- Doctoral Fellowship of The University of Texas at Austin (about 30,000$). 2021
- Third Prize of Scientific Research Student Award of Hanoi University of Science and Technology. 2019

Technical Skills

- **Python:** Proficient.

  Libraries: Pytorch (proficient), Tensorflow (basic), Scikit-Learn (proficient), Numpy (proficient), Pandas (basic), Matplotlib (proficient), Pyspark (basic), and so on.
- **Java**: Basic.
- **C/C++**: Basic.
- **Developer Tools:** Git.
- **Systems:** Linux.