Yifan Chen

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Research Interests

I am broadly interested in the general area of **efficient machine learning**, aiming to understand the statistical structures of modern machine learning algorithms and apply these insights to real-world computational challenges.

I especially focus on **non-parametric models** and neural networks with intensive matrix operations, such as **transformers** (language models) and graph neural networks (**GNNs**).

Academic Positions and Education

Hong Kong Baptist University, Hong Kong, China — Aug 2023 –

- Assistant Professor in Computer Science and Mathematics (affiliate)

University of Illinois Urbana-Champaign (UIUC), Illinois, United States — Aug 2018 – Aug 2023

- Ph.D. in Statistics, advisor: Prof. Yun Yang
- M.S. in Statistics — May 2022

Fudan University, Shanghai, China — Sept 2013 – July 2018

- B.S. in Statistics, School of Management

The University of British Columbia, British Columbia, Canada — Sept 2016 – Dec 2016

- Exchange Student at the UBC Sauder School of Business

Honors, Awards, and Grants

Start-up Grant, Hong Kong Baptist University — 2023
Dissertation Completion Fellowships (declined due to early graduation), USD **$25,000**, U of I Graduate College — 2023
The Fortieth International Conference on Machine Learning (ICML 2023) Grant Award, USD **$1,500** — 2023
Graduated with distinction: *Shanghai Outstanding Graduate*, Shanghai Municipal Education Commission — 2018
Singapore Technologies Engineering Ltd Scholarship (top 5%), CNY **¥15,000**, Fudan University — 2015 – 2017
Sumitomo Corporation Scholarship (top 5%), CNY **¥3,000**, Fudan University — 2013 – 2014

Industry Experiences

Microsoft, Washington, United States — May 2022 – Aug 2022

Research Intern — Mentor: Ritchie Zhao, Bita Darvish Rouhani
Study the compression of Mixture-of-Experts Transformers. We reconstruct expert MLPs through optimal transport. The work here motivates the follow-up project [3], published at ICML 2023.

Amazon, California, United States — Aug 2021 – Dec 2021

Applied Scientist Intern — Mentor: Di Jin, Dilek Hakkani-Tur
Do research on parameter-efficient fine-tuning, with [5], [7] accepted to EMNLP 2022 Oral, NAACL 2022 Findings respectively. We explore the connection between attention and kernel estimators to guide the parameter assignments in adapters.

Publications and Manuscripts (* Co-first author, ✉ Corresponding author)

Summary (2021-present): **10** first-authored/supervised papers

Peer-reviewed conference and journal papers

[1] **Hypervolume Maximization: A Geometric View of Pareto Set Learning**
Xiaoyuan Zhang, Bo Xue, Xi Lin, Yifan Chen, Qingfu Zhang (**Role**: proof, writing, co-mentoring)
Thirty-seventh Conference on Neural Information Processing Systems (NeurIPS 2023)

[2] **A Gromov–Wasserstein Geometric View of Spectrum-Preserving Graph Coarsening**
Yifan Chen, Rentian Yao, Yun Yang, Jie Chen
The Fortieth International Conference on Machine Learning (ICML 2023)

[3] **NTK-approximating MLP Fusion for Efficient Language Model Fine-tuning**
Tianxin Wei*, Zeming Guo*, Yifan Chen*, Jingrui He (**Role**: main idea, proof, writing, co-mentoring)
The Fortieth International Conference on Machine Learning (ICML 2023)

[4] **Calibrate and Debias Layer-wise Sampling for Graph Convolutional Networks**
Yifan Chen*, Tianning Xu*, Dilek Hakkani-Tur, Di Jin, Yun Yang, Ruoqing Zhu
Transactions on Machine Learning Research (TMLR), 2023

[5] **Inducer-tuning: Connecting Prefix-tuning and Adapter-tuning**
Yifan Chen*, Devamanyu Hazarika*, Mahdi Namazifar, Yang Liu, Di Jin, Dilek Hakkani-Tur
The 2022 Conference on Empirical Methods in Natural Language Processing (EMNLP 2022) **Oral**

[6] **Sketching as a Tool for Understanding and Accelerating Self-attention for Long Sequences**
Yifan Chen*, Qi Zeng*, Dilek Hakkani-Tur, Di Jin, Heng Ji, Yun Yang
2022 Annual Conference of the North American Chapter of the Association for Computational Linguistics (NAACL 2022) **Oral**

[7] **Empowering parameter-efficient transfer learning by recognizing the kernel structure in self-attention**
Yifan Chen*, Devamanyu Hazarika*, Mahdi Namazifar, Yang Liu, Di Jin, Dilek Hakkani-Tur
2022 Annual Conference of the North American Chapter of the Association for Computational Linguistics (NAACL 2022) Findings

[8] **Skyformer: Remodel Self-Attention with Gaussian Kernel and Nyström Method**
Yifan Chen*, Qi Zeng*, Heng Ji, Yun Yang
Thirty-Fifth Conference on Neural Information Processing Systems (NeurIPS 2021)

[9] **Accumulations of Projections—A Unified Framework for Random Sketches in Kernel Ridge Regression**
Yifan Chen, Yun Yang
The 24th International Conference on Artificial Intelligence and Statistics (AISTATS 2021)

[10] **Fast Statistical Leverage Score Approximation in Kernel Ridge Regression**
Yifan Chen, Yun Yang
The 24th International Conference on Artificial Intelligence and Statistics (AISTATS 2021)

[11] **Narrowing the Gap between Professionality and Popularity: An Empirical Investigation on Community QA**
Chenghong Zhang, Yifan Chen, Hongyue Lan, Yicheng Zhang, Tian Lu
American Conference on Information Systems (AMCIS 2017) Session on TREOS

Preprints and submissions

[12] **Sampling-based Randomized Sketching for Approximate Matrix Multiplication**
Yifan Chen, Yun Yang

[13] **Connecting Cross-Domain Representations: A Ladder for Domain Generalization**
Tianxin Wei*, Yifan Chen*, Xinrui He, Jingrui He (**Role**: proof, writing, co-mentoring)

[14] **Statistical Leverage Score Approximation for Penalized Kernel Empirical Risk Minimization**
Yifan Chen, Yun Yang

Patents

[1] **Sanitary wastewater reuse system**
Yifan Chen
China Patent CN202187397U, published 2012-04-11

Teaching Experience

Instructor

- COMP 7070: Advanced Topics in Artificial Intelligence and Machine Learning — Spring 2024

Discussion Leader

- STAT 400: Statistics and Probability I — Spring 2022, Fall 2022
  Instructor: Albert Yu

Teaching Assistant

- STAT 425: Statistical Modeling I (Upper undergraduate level) — Spring 2023
  Instructor: Prof. Trevor H. Park
- STAT 576: Empirical Process Theory and Weak Convergence (Ph.D. core course) — Spring 2021
  Instructor: Prof. Sabyasachi Chatterjee
- CSE 428: Statistical Computing (Upper undergraduate level) — Fall 2019, Fall 2020
  Instructor: Uma Ravat, Prof. Shulei Wang
- STAT 510: Mathematical Statistics (Ph.D. core course) — Spring 2020
  Instructor: Prof. Yun Yang
- STAT 410: Statistics and Probability II — Spring 2019, Summer 2019
  Instructor: Prof. Yun Yang, Alexey G Stepanov
- STAT 400: Statistics and Probability I — Fall 2018
  Instructor: Prof. Hyoeun Lee

Mentoring Experience

- Zeming Guo, Undergraduate at UIUC (now Master at Cornell).
  Topic: Efficient Transformers. **had a first-author paper published at ICML 2023**.
- Xiaoyuan Zhang, Ph.D. Student at CityU.
  Topic: Deep Learning Theory. **had a first-author paper published at NeurIPS 2023**.

Professional Services

Program Committee

- International Conference on Machine Learning (ICML) — 2022, 2023
- Neural Information Processing Systems (NeurIPS) — 2022, 2023
- AAAI Conference on Artificial Intelligence (AAAI) — 2023
- International Conference on Artificial Intelligence and Statistics (AISTATS) — 2023
- Annual Conference of the North American Chapter of the Association for Computational Linguistics (NAACL) — 2024

Journal Reviewer

- Statistica Sinica
- Computational Statistics & Data Analysis
- Journal of Machine Learning Research
- IEEE Transactions on Information Theory
- Journal of the American Statistical Association

External Conference Reviewer

- The Conference on Information and Knowledge Management (CIKM) — 2022

Professional Talks

- A Gromov–Wasserstein Geometric View of Spectrum-Preserving Graph Coarsening
  HKBU Math department, Hong Kong, Aug 2023
- NTK-approximating MLP Fusion for Efficient Language Model Fine-tuning
  At the 1st International Conference on AI-generated Content (AIGC2023), Remote, Aug 2023
- Inducer-tuning: Connecting Prefix-tuning and Adapter-tuning
  At EMNLP 2022, Remote, Dec 2022
- One Expert with Multiple Instruments
  Microsoft Azure, Remote, Aug 2022

- Sketching as a Tool for Understanding and Accelerating Self-attention for Long Sequences
  AI Time PhD NAACL Special Session, Remote, Aug 2022
- Sketching as a Tool for Understanding and Accelerating Self-attention for Long Sequences
  At NAACL 2022, Seattle, Washington, United States, July 2022
- Empowering parameter-efficient transfer learning by recognizing the kernel structure in self-attention
  Amazon Alexa AI, Sunnyvale, California, United States, Dec 2021
- Skyformer: Remodel Self-Attention with Gaussian Kernel and Nyström Method
  At NeurIPS 2021, Remote, Dec 2021
- Fast Statistical Leverage Score Approximation in Kernel Ridge Regression
  At AISTATS 2021, Remote, Apr 2021