+1 (224) 714-8320
timtsz-kit.lau@chicagobooth.edu
timlautk.github.io
timlautk

Tim Tsz-Kit LAU

Education and Experience

10/2023 – Present **Principal Researcher in Econometrics and Statistics**, *The University of Chicago Booth School of Business*, Chicago, IL, USA
Mentor: Prof. Mladen Kolar

9/2018 – 12/2023 **PhD in Statistics**, *Department of Statistics and Data Science, Northwestern University*, Evanston, IL, USA
Advisor: Prof. Han Liu

9/2018 – 6/2020 **MS in Statistics**, *Department of Statistics and Data Science, Northwestern University*, Evanston, IL, USA

9/2016 – 6/2017 **MSc in Big Data Technology**, *Departments of Mathematics and Computer Science & Engineering, The Hong Kong University of Science and Technology (HKUST)*, Clear Water Bay, New Territories, Hong Kong
Research Supervisors: Prof. Jianfeng Cai and Prof. Yuan Yao

1/2017 – 6/2017 **Exchange Program for MSc in Big Data Technology, Applied Mathematics Option—Data Track**, *CentraleSupélec (École Centrale Paris), Université Paris-Saclay*, Châtenay-Malabry, Île-de-France, France
Research Supervisors: Dr. Émilie Chouzenoux and Prof. Jean-Christophe Pesquet

9/2015 – 7/2016 **Master of Statistics (MStat)**, *The University of Hong Kong (HKU)*, Pokfulam, Hong Kong

9/2012 – 6/2015 **BSc in Mathematics**, *The University of Hong Kong (HKU)*, Pokfulam, Hong Kong

Other Experience

6–9/2023 **Applied Scientist Intern**, *AWS AI Labs*, Amazon Web Services, Santa Clara, California, USA
- Working in the optimization group on large-scale stochastic nonsmooth nonconvex optimization methods and training strategies for large language model (LLM) pre-training;
  Mentors: Dr. Parameswaran Raman, Prof. Shoham Sabach (Technion), Prof. Mingyi Hong (University of Minnesota)

6–9/2021 **Machine Learning Scientist Intern**, *Zebra Technologies Corporation*, Lincolnshire, Illinois, USA (Remote)
- Developing multi-agent model-based reinforcement learning algorithms with applications to robotics;
  Mentor: Dr. Biswa Sengupta

8/2018 **Research Visit**, *RIKEN Center for Advanced Intelligence Project*, Tokyo, Japan
- Research in Bayesian neural network training algorithms; Host: Dr. Emtiyaz Khan

8/2017 – 2/2018 **Research Assistant**, *Department of Mathematics, The Hong Kong University of Science and Technology*
- Research in optimization and machine learning; Supervisors: Prof. Jianfeng Cai and Prof. Yuan Yao

Research Interests

Machine Learning, Optimization and Statistics

I am interested in the mathematical and statistical foundations of machine learning and data science. In particular, I am interested in
- Theory and applications of optimization and sampling techniques to generative artificial intelligence (GenAI), e.g., training strategies of large language models (LLMs) and attention-based vision models (e.g., vision transformer), and score-based generative models (SGMs; a.k.a. diffusion models)
- Optimization for machine learning and statistics, particularly stochastic, nonsmooth, nonconvex and/or distributionally robust optimization algorithms
- The interplay between optimization and sampling
- High-dimensional statistical inference
- Estimation of high-dimensional covariance and precision matrices and its applications

Publications

Tim Tsz-Kit Lau, Parameswaran Raman, Mingyi Hong, Shoham Sabach, and Han Liu. Adaptive batch size schemes for large-scale training with data parallelism. *In preparation*, 2023a.

Tim Tsz-Kit Lau, Jiahui Lyu, Hongmei Jiang, Han Liu, and Jean-Christophe Pesquet. Deep unfolded proximal methods for regularized M-estimators in high dimensions. *In preparation*, 2023b.

Tim Tsz-Kit Lau, Han Liu, and Jean-Christophe Pesquet. Global optimization of nonsmooth weakly convex

functions via simulated annealing. *In preparation*, 2023c.

Tim Tsz-Kit Lau, Han Liu, and Thomas Pock. Non-log-concave and nonsmooth sampling via Langevin Monte Carlo algorithms. In Alessandro Benfenati, Tatiana A. Bubba, Federica Porta, and Marco Viola, editors, *Special Issue for The Advanced Techniques in Optimization for Machine learning and Imaging (ATOMI) Workshop*, Springer INdAM Series. Springer, 2023d. URL `https://arxiv.org/abs/2305.15988`. To appear.

Tim Tsz-Kit Lau and Han Liu. Wasserstein distributionally robust optimization via Wasserstein barycenters. *arXiv preprint arXiv:2203.12136*, 2022a.

Tim Tsz-Kit Lau and Han Liu. Bregman proximal Langevin Monte Carlo via Bregman–Moreau envelopes. In *Proceedings of the 39th International Conference on Machine Learning (ICML)*, 2022b. URL `https://proceedings.mlr.press/v162/lau22a.html`.

Jinshan Zeng*, **Tim Tsz-Kit Lau***, Shaobo Lin, and Yuan Yao. Global convergence of block coordinate descent in deep learning. In *Proceedings of the 36th International Conference on Machine Learning (ICML)*, 2019. URL `http://proceedings.mlr.press/v97/zeng19a.html`.

Émilie Chouzenoux, **Tim Tsz-Kit Lau**†, Claire Lefort, and Jean-Christophe Pesquet. Optimal multivariate Gaussian fitting with applications to PSF modeling in two-photon microscopy imaging. *Journal of Mathematical Imaging and Vision*, 61(7):1037–1050, 2019. URL `https://doi.org/10.1007/s10851-019-00884-1`.

Tim Tsz-Kit Lau, Jinshan Zeng, Baoyuan Wu, and Yuan Yao. A proximal block coordinate descent algorithm for deep neural network training. In *International Conference on Learning Representations (ICLR), Workshop Track*, 2018a. URL `https://openreview.net/forum?id=HycIjFkPM`.

Tim Tsz-Kit Lau, Émilie Chouzenoux, Claire Lefort, and Jean-Christophe Pesquet. Optimal multivariate Gaussian fitting for PSF modeling in two-photon microscopy. In *IEEE 15th International Symposium on Biomedical Imaging (ISBI)*, 2018b. URL `https://goo.gl/GD9Eki`.

Tsz Kit Lau and Yuan Yao. Accelerated block coordinate proximal gradients with applications in high dimensional statistics. In *The 10th NIPS Workshop on Optimization for Machine Learning*, 2017. URL `https://arxiv.org/abs/1710.05338`.

*Equal contribution †Alphabetical order

Invited/Contributed Talks & Presentations

INFORMS — **Global Optimization of Nonsmooth Weakly Convex Functions via Simulated Annealing**, *2023 INFORMS Annual Meeting*, Phoenix, AZ, 13–18 October 2023

ICML — **Bregman Proximal Langvein Monte Carlo via Bregman–Moreau Envelopes**, *39th International Conference on Machine Learning*, Baltimore, MD, 17–23 July 2022

IMS Annual Meeting — **Wasserstein Distributionally Robust Estimation with Wasserstein Barycenters: Statistical Analysis and Applications**, *IMS Annual Meeting*, London, United Kingdom, 27–30 June 2022

ATOMI Workshop — **Wasserstein Distributionally Robust Optimization with Wasserstein Barycenters**, *Advanced Techniques in Optimization for Machine learning and Imaging (ATOMI), INdAM Workshop*, Rome, Italy, 20–24 June 2022

Statistics in the Big Data Era Workshop — **Wasserstein Distributionally Robust Estimation with Wasserstein Barycenters: Statistical Analysis and Applications**, *Simons Institute for the Theory of Computing*, Berkeley, CA, 1–3 June 2022

HKUST — **Global Convergence of Block Coordinate Descent in Deep Learning**, *Seminar on Data Science and Machine Learning*, Department of Mathematics, HKUST, Hong Kong, July 2019

ICML — **Global Convergence of Block Coordinate Descent in Deep Learning**, *36th International Conference on Machine Learning*, Long Beach, CA, June 2019

Scholarships & Awards

IMS Hannan Graduate Student Travel Award — For a contributed talk at the 2022 IMS Annual Meeting, London, United Kingdom

Conference Travel Grant — For attending the 2022 IMS Annual Meeting, London, United Kingdom, by The Graduate School and Department of Statistics and Data Science, Northwestern University

ICML Travel Award	For a paper presentation at ICML 2019
School of Engineering MSc Excellent Student Scholarship	**Master of Science in Big Data Technology MSc(BDT)**, *HKUST*, Hong Kong, 2017 ○ To encourage outstanding academic performance and to recognize academically well performed MSc(BDT) students (Top 10%; one of the eight awardees)
Top Students Award	**Master of Science in Big Data Technology MSc(BDT)**, *HKUST*, Hong Kong, 2017 ○ Awarded to the top 4 MSc(BDT) students in descending amounts of monetary awards ○ Ranked 1st in the graduating class of 65 students

Academic Services

Journal Reviewer (7 in total)	○ IEEE Transactions on Signal Processing (2018—1, 2019—1, 2020—2) ○ SIAM Journal on Imaging Sciences (2021) ○ Neural Computation (2021) ○ IEEE Computational Intelligence Magazine (2022)
Conference Reviewer (41 in total)	NeurIPS: 2020 (6), 2021 (6), 2022 (5), 2023 ICML: 2021 (5), 2022 (3), 2023 (4) ICLR: 2021 (3), 2022 (3), 2024 (4) AISTATS: 2020 (1), 2021 (2), 2022 (3), 2024

Teaching Experience (Teaching Assistant)

STAT 210	Introduction to Statistics for the Social Sciences	STAT 320-1	Statistical Theory and Methods I
STAT 351	Design and Analysis of Experiments	STAT 352	Nonparametric Statistical Methods
STAT 359	Data Science Project	STAT 348	Applied Multivariate Analysis
STAT 420-3	Introduction to Statistical Theory and Methodology III	STAT 435	Mathematical Foundations of Machine Learning
STAT 461	Advanced Topics in Statistics: Bayesian Statistics	Summer 2021	Mathematical Statistics Bootcamp for First-year Ph.D. Students

Professional Memberships

IMS	Institute of Mathematical Statistics	ASA	American Statistical Association
SIAM	Society for Industrial and Applied Mathematics	INFORMS	Institute for Operations Research and the Management Sciences

Computer Skills

Computation & Programming	Python, R, Matlab, Mathematica	Typesetting	LaTeX
Deep Learning	PyTorch (Lightning), JAX		

Languages

English	Fluent	French	Beginner
Cantonese	Native	Mandarin	Fluent