Peter Chen

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Research Statement

My current focus is LLM reasoning and alignment via optimization theory and reinforcement learning design. My areas of expertise include:

1. **LLM Post Training**: Reasoning via RLVR; Alignment (RLHF/DPO); Agent Training.
2. **Optimization/RL Theory**: Optimal Transport; Non-convex Optimization; Minimax Optimization; Zeroth-order Optimization; Multi-agent Reinforcement Learning.

Education

Columbia College, Columbia University — New York, NY
B.A in Mathematics, Computer Science — May 2026
Advisor: Andrew Blumberg (Math), Tianyi Lin (IEOR)

Experience

Research Intern | AI Lab, Princeton University — Princeton, NJ
Hosted by Prof. Mengdi Wang — Feb 2025 – Dec 2025
Topic: LLM RL Reasoning; LLM Agent Training

Research Intern | Institute of Data Science, HKU — Hong Kong
Hosted by Prof. Yue Xie, Prof. Qingpeng Zhang — May 2024 – Aug 2024
Topic: Neural Optimal Transport, Convex Networks

Teaching Assistant | Department of Mathematics, Columbia University
TA for MATH 2500 Analysis & Optimization over SP24, FA24, SP25, FA25, SP26

Publications

ComPO: Preference Alignment via Comparison Oracles
***Peter Chen**, Xi Chen, Wotao Yin, Tianyi Lin*
Advances in Neural Information Processing Systems 38 (NeurIPS 2025)

Exploration v.s. Exploitation: Rethinking RLVR through Clipping, Entropy, and Spurious Reward
***Peter Chen**, Xiaopeng Li, Ziniu Li, Xi Chen, Wotao Yin, Tianyi Lin*
arxiv-2512.16912

GenEnv: Difficulty-Aligned Co-Evolution Between LLM Agents and Environment Simulators
Jiacheng Guo, Ling Yang*, **Peter Chen***, Qixin Xiao*, Yinjie Wang, Xinzhe Juan, Jiahao Qiu, Ke Shen, Mengdi Wang*
arxiv-2512.19682

Stepwise Guided Policy Optimization: Coloring your Incorrect Reasoning in GRPO
***Peter Chen**, Xiaopeng Li, Ziniu Li, Xi Chen, Tianyi Lin*
arxiv-2505.11595

Displacement-Sparse Neural Optimal Transport
***Peter Chen**, Yue Xie, Qingpeng Zhang*
arxiv-2502.01889

3D Cell Oversegmentation Correction via Geo-Wasserstein Divergence
***Peter Chen**, Bryan Chang, Olivia Creasey, Julie Sneddon, Zev Gartner, Yining Liu*
Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision 2026 (WACV 2026)

SICNN: Sparsity-induced Input Convex Neural Network for Optimal Transport
***Peter Chen**, Yue Xie, Qingpeng Zhang*
NeurIPS 2024 Optimization for Machine Learning

Talks

2025 INFORMS Annual Meeting, Atlanta — Oct 2025
Invited Speaker; *LLM Post Training: Turning "Trash" Samples into Value*

SERVICES

Reviewers for: *Conference on Neural Information Processing Systems* (NeurIPS), *International Conference on Learning Representaton* (ICLR), *AAAI Conference on Aritificial Intelligence* (AAAI), *Transactions on Machine Learning Research* (TMLR)