Winnie Xu

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Research Experience

Google DeepMind, **Gemini Research** — Mountain View, CA, USA
Research Scientist with Omer Levy & Jack Rae — 2025-04 –
Work on deep learning for Gemini workstreams involving data, pre-training, post-training, reasoning, and multimodality.
Topics: reasoning, RLHF, LLMs, test-time scaling, synthetic data

Contextual AI, **Member of Technical Staff** — Palo Alto, CA, USA
Research Engineer with Douwe Kiela & Amanpreet Singh — 2023-07 – 2024-11
Developed model alignment methods, synthetic data pipelines, and ideas for process-level feedback optimization.
Topics: retrieval, RLHF, Kahneman-Tversky Optimization, fine-tuning, test-time scaling, sampling, synthetic data

Meta, **Fundamental AI Research (FAIR Labs)** — New York, NY, USA
Research Scientist Intern with Karen Ullrich & Matthew Muckley — 2022-09 – 2023-05
Paper exploring a new neural architecture by optimizing for the bit-rate encoding of deep compression models.
Topics: generative models, compression, information theory, representation learning, autoencoding

Stanford University, **Stanford AI Laboratory** — Palo Alto, CA, USA
Visiting Research Scholar with Prof. Stefano Ermon & Chelsea Finn — 2021-06 – 2021-11
(1) Self-referential operators for data encoding, (2) Latent-space diffusion, (3) Permutation-equivariant learning.
Topics: score-based generative models, latent variable models, implicit representation learning, transformers

Google DeepMind, Research — Mountain View, CA, USA
Research Scientist Intern with Igor Mordatch & Durk Kingma & David Dohan — 2021-10 – 2022-08
(1) Robotics: paper on improved Decision Transformers that extrapolate in general ways in embodied game play and online decision-making. (2) Generative Models: proposed spectral diffusion architecture that is resolution agnostic via adaptive signal scheduling. (3) Post-training LLMs: LMs as probabilistic programs; paper on *Cascades* framework.
Topics: diffusion models, Transformers, large language models, reasoning in uncertainty, reinforcement learning

Vector Institute & **University of Toronto** — Toronto, ON, Canada
Undergraduate Researcher with Prof. David Duvenaud — 2020-01 – 2021-01
Derive variance-reducing gradient estimator and improve Neural ODE robustness through Bayesian inference w/ SDEs.
Topics: stochastic differential equations, Bayesian neural networks, variational inference

Select Publications

Peer-Reviewed

[8] Karel DOosterlinck, **Winnie Xu**, Chris Chris Develder, Thomas Demeester, Amanpreet Singh, Christopher Potts, Douwe Kiela, and Shikib Mehri, "Anchored preference optimization and contrastive revisions: Addressing underspecification in alignment," Safe Generative AI Workshop at NeurIPS 2024, 2024.

[7] Kawin Ethayarajh, **Winnie Xu**, Dan Jurafsky, and Douwe Kiela, "KTO: Model alignment as prospect theoretic optimization," International Conference on Machine Learning [**Spotlight Award**], 2024.

[6] **Winnie Xu**, Nikita Vassilyev, Douwe Kiela, and Shikib Mehri, "Learning from natural language preferences," In progress, 2024.

[5] **Winnie Xu**, Matthew Muckley, Yann Dubois, and Karen Ullrich, "Revisiting associative compression: I can't believe it's not better," *International Conference on Machine Learning Neural Compression Workshop*, 2023.

[4] David Dohan*, **Winnie Xu***, Aitor Lewkowycz, Jacob Austin, David Bieber, Raphael Gontijo Lopes, Yuhuai Wu, Henryk Michalewski, Rif A. Saurous, Jascha Sohl-dickstein, Kevin Murphy, and Charles Sutton, "Language model cascades," *Beyond Bayes: Paths Towards Universal Reasoning Systems, International Conference on Machine Learning* [**Contributed Talk**], 2022.

[3] †Kuang-Hui Lee*, Ofir Nachum*, Mengjiao Yang, Lisa Lee, **Winnie Xu**, Daniel Freeman, Sergio Guadarrama, Ian Fischer, Eric Jang, Henryk Michalewski, and Igor Mordatch*, "Multi-game decision transformers," *Neural Information Processing Systems* [**Oral**], 2022.

[2] Michael Poli*, **Winnie Xu***, Stefano Massaroli, Chenlin Meng, and Stefano Ermon, "Self-similarity priors: Neural collages as differentiable fractal representations," *Neural Information Processing Systems*, 2022.

[1] **Winnie Xu**, Ricky T.Q. Chen, Xuechen Li, and David Duvenaud, "Infinitely deep bayesian neural networks with stochastic differential equations," *International Conference on Artificial Intelligence and Statistics*, 2022.

*co-first authorship, †ordering by seniority

Professional Experience

Cohere, **Large Language Models** Toronto, ON, Canada
Machine Learning Researcher with Nick Frosst and Aidan Gomez 2021-01 – 2021-06
Apply deep learning algorithms to improve training cost and personalization of billion parameter language models.
Topics: GPT, attention, distillation, distributed cloud training, TPUs

Nvidia, **Simulations & Robotics** Toronto, ON, Canada
Deep Learning Research Intern with Gavriel State and Prof. Animesh Garg 2020-08 – 2020-12
Build performant GPU-accelerated environments towards time / resource efficient reinforcement learning for robotics.
Topics: Omniverse, IsaacGym, robotics simulation

Google, **Tensorflow** Mountain View, CA, USA
Research Engineering Intern with Dr. Tomer Kaftan 2020-05 – 2020-08
Actualize state of the art pre-/post-hoc pruning methods for easy experimentation and efficient hardware computation.
Topics: lottery tickets, dynamic sparsity, Tensorflow Model Optimization Toolkit (contributor)

Education

University of Toronto 2017 – 2020, 2021 – 2022
Honours Bachelors of Science in *Computer Science, Statistics, Mathematics* High Distinction
Graduate coursework: Natural Language Processing (CSC401), Probabilistic Reasoning and Uncertainty (CSC412), Deep Learning (CSC413), Stochastic Processes (STA447), Computer Vision (CSC420)
Natural/Social Sciences (2017-2019): Evolutionary/Molecular Genetics (BIO120/130), Physical/Organic Chemistry (CHM135/135), Calculus (MAT135/136/235), Political Sciences (MUN101), Global Affairs (MUN102)

Teaching

CSC258: Intro. to Computer Systems, University of Toronto Fall 2020
Teaching Assistant with Prof. Steve Engels. Head of content development (labs/assignments). Ran office hours.

Awards

Research Fellowship, Constellation / UC Berkeley 2024
Awarded to researchers working on AI safety and alignment in collaboration with various organizations focused on risk mitigation, capabilities research, and evaluations.

Finalist Award, Outstanding Undergraduate Researcher, Computing Research Association (CRA) 2022
Awarded to top undergraduate computer science researchers in North America. Finalist awarded to Top 20 overall.

Scholar Award, Neural Information Processing Systems (NeurIPS) 2022
Awarded to fund in-person conference attendance for select first-author student presenters.

Cloud TPU Research Award, Google Research 2022
Awarded to fund independent researchers in AI with access to Google's Cloud TPU compute resources.

Undergraduate Student Research Award, NSERC [*declined*] 2020
Awarded to fund a summer research internship in Canada. Declined due to dual employment in industry internship.

Dean's List Scholar, University of Toronto 2018, 2019, 2021
Awarded on the basis of grade point average (cGPA).

Trinity College Academic Scholarship, University of Toronto 2019
Awarded on the basis of academic standing.