Winnie Xu

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Research Experience

Meta AI, **Fundamental AI Research (FAIR)** — New York, NY, USA
Research Scientist Intern with Dr. Karen Ullrich & Matthew Muckley — 2022-09 – ongoing
Research at the intersection of generative modeling and neural compression.
Topics: generative models, compression, information theory, representation learning

Stanford University, **Stanford AI Laboratory** — Palo Alto, CA, USA
Visiting Research Scholar with Prof. Stefano Ermon — 2021-06 – 2021-11
Develop self-referential operators for fractal data encoding, efficient compression, and creative generation.
Topics: score-based generative models, diffusion processes, latent variable models, implicit representation learning

Google Research, **Brain Team** — Mountain View, CA, USA
Research Scientist Intern / Student Researcher with Dr. Igor Mordatch & David Dohan — 2021-10 – 2022-08
(1) Improve Decision Transformer models to extrapolate in creative and general ways towards embodied game play and online decision-making. (2) Develop spectral diffusion models leveraging resolution agnostic architectures and signal adaptive scheduling. (3) Formalize language models as probabilistic programs via *Cascades* framework.
Topics: diffusion models, Transformers, large language models, reinforcement learning, robotics, decision-making

Vector Institute & **University of Toronto** — Toronto, ON, Canada
Undergraduate Researcher with Prof. David Duvenaud — 2020-01 – 2021-08
Derive variance-reducing gradient estimator and improve Neural ODE robustness through Bayesian inference w/ SDEs.
Topics: stochastic differential equations, Bayesian neural networks, variational inference

Oxford University, **OATML** — Oxford, United Kingdom
Research Intern with Prof. Yarin Gal — 2021-01 – 2021-08
Derive data efficient algorithms that leverage information theoretic proxy selection and uncertainty-aware heuristics.
Topics: Bayesian active learning, model disagreement, curriculum learning, coreset selection

Princess Margaret Cancer Research, **Computational Biology** — Toronto, ON, Canada
Research Intern with Prof. Michael Hoffman — 2018-05 – 2018-09
Develop annotation pipelines and unsupervised learning techniques to predict 20+ cancer-linked epigenetic factors.
Topics: next-generation sequencing (ChIP-seq,-exo, RNA-seq), genome annotations

Publications

Peer-Reviewed

[6] Sören †Mindermann*, Muhammed Razzak*, **Winnie Xu***, Andreas Kirsch, Mrinank Sharma, Aidan N. Gomez, Sebastian Farquhar, Jan Brauner, and Yarin Gal, "Prioritized training on points that are learnable, worth learning, and not yet learned," *International Conference on Machine Learning*, 2022.

[5] 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.

[4] Soon Hoe Kim, N. Benjamin Erichson, Francisco Utrera, **Winnie Xu**, and Michael Mahoney, "Noisy feature mixup," *International Conference on Learning Representations*, 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*, 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, **Natural Language Understanding** 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
Course Teaching Assistant with Prof. Steve Engels

Academic Awards

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

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

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

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.

Axelrad Award, Princess Margaret Cancer Research Centre 2018
Awarded to top cancer research project in Computer Science at annual poster symposium.

Undergraduate Student Research Award, University of Toronto 2018
Awarded to fund a summer research internship in Computer Science at the University of Toronto.

Honors

Interact Fellowship, Interact 2021
A community of mission-driven, conscientious technologists. 100 fellows selected worldwide per annum.

Deep Tech Fellowship, On Deck 2021
Awarded to fund the participation in the On Deck Deep Tech fellowship program. 10 selected per annum.

1st Place, Hack the North 2019
Awarded to top project of the year at Canada's largest Major League sponsored hackathon.

1st Place, Google x BCG Hack the Globe Competition 2019
Awarded to top project of the year based on social impact and technological delivery.

1st Place, Sanofi Biogenius Canada 2017
Awarded for best research project to qualify for the National Biogenius Challenge.

Top 20 in Fair, Canada-Wide Science Fair 2017
Awarded to top 20 best projects in the Senior category out of over 500 competitors.

Top 15% Distinction, Waterloo National Mathematics Contest 2015, 2016, 2017
Awarded for ranking among the top 15 participants in the annual Cayley, Fermat, and Euclid contests.

Professional Activities

Workshop Program Chair

Symbiosis of Deep Learning and Differential Equations, Neural Information Processing Systems (NeurIPS) 2022

Conference Paper Reviewing

Conference on Neural Information Processing Systems (NeurIPS) 2022
International Conference on Machine Learning (ICML) 2022
International Conference on Learning Representations (ICLR) 2021

Journal Reviewing

Journal of Machine Learning Research (JMLR) 2022

Invited Talks, Presentations, and Panels

Talks

[1] *Infinitely deep bayesian neural networks*, NeurIPS European Bayesian Deep Learning Meetup, Virtual, 2020.

Panels

[3] *Global event speaker*, Women Who Codes, Virtual, 2022.

[2] *Introduction to AI forum*, Vector Institute, Toronto, Canada, 2021.

[1] *AI student researcher panel*, AI Squared Forum, Toronto, Canada, 2019.

Community Service and Leadership

Cohere FOR.ai, **Open-source Collaboration** Toronto, Canada
Research organization community lead 2019 – present

Girls Who ML, **Oxford University** Oxford, United Kingdom
Workshop leader and academic content creator 2021

Computer Science Mentorship Program, **University of Toronto** Toronto, ON, Canada
Mentor to various underclassmen in Computer Science 2019 – present

Machine Intelligence Student Team (MIST), **University of Toronto** Toronto, ON, Canada
Vice President of Academics 2019 – 2020

Computer Science Orientation Week, **University of Toronto** Toronto, ON, Canada
Orientation Leader 2019

Technical Skills

Languages: Python, C/C++ , Java, Golang, Bash
Libraries and Tools: JAX, PyTorch, TensorFlow, GCP, TPU, Slurm, Docker, Matplotlib, Git, Unix, LaTeX