Winnie Xu

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Research Experience

Google Research, **Brain** — Mountain View, CA, USA
Research Scientist Intern / Student Researcher with Dr. Igor Mordatch — 2021-10 – ongoing
(1) Improve Decision Transformer models to extrapolate in creative and general ways towards embodied game play and biological sequence design problems. (2) Enable 3D neural implicit scene representations with diffusion models.
Topics: sequence modeling, Transformers, language representation, reinforcement learning, biology

Stanford University, **Stanford AI Research** — Palo Alto, CA, USA
Visiting Research Scholar with Prof. Stefano Ermon — 2021-06 – ongoing
(Fall 2021) Develop self-referential operators for fractal data encoding, efficient compression, and creative generation.
(Summer 2021) Derive noise-invariant score-based generative models with improved likelihood and sample quality.
Topics: score-based generative models, diffusion processes, latent variable models

Vector Institute & **University of Toronto** — Toronto, ON, Canada
Undergraduate Researcher with Prof. David Duvenaud — 2020-01 – 2021-09
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
Develop 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

Industry 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 models, 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 — 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)

Google, **Cloud** — Waterloo, ON, Canada
Software Engineering Intern — 2019-05 – 2019-08
Integrate remote build execution pipelines on Google Cloud Registry for Docker and Bazel clients worldwide.
Topics: remote build, cloud infrastructure tooling, rules-docker (contributor)

Education

University of Toronto — 2017 – 2020, 2021 – 2022
Honours Bachelors of Science in *Computer Science, Statistics, Mathematics* — Deans List Scholar
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

Publications

Peer-Reviewed

[3] Soon Hoe Kim, N. Benjamin Erichson, Francisco Utrera, **Winnie Xu**, and Michael Mahoney, "Noisy feature mixup," International Conference on Learning Representations, 2022.

[2] **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.

[1] **Winnie Xu***, Sören Mindermann*, Muhammed Razzak*, 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," *Workshop in Subset Selection in ML,* ICML, 2021.

Under Review

[2] Soon Hoe Kim, N. Benjamin Erichson, Francisco Utrera, **Winnie Xu**, Jiang Cao, and Michael Mahoney, "Noisymix: Boosting robustness by combining data augmentations, stability training, and noise injections," In Submission to ICLR, 2022.

[1] **Winnie Xu***, Michael Poli*, Chenlin Meng, and Stefano Ermon, "Self-similarity priors: Neural collages as differentiable fractal representations," In Submission to ICML, 2022.

*equal contribution, †author ordering by seniority

Awards

Finalist, Outstanding Undergraduate Researcher Award, Computing Research Association (CRA) — 2021
Awarded to top undergraduate computer science researchers in North America.

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

Deep Tech Fellowship, On Deck — 2021
Awarded to fund the participation in the On Deck Deep Tech fellowship program.

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 for one of 20 best projects in the Senior category out of 500.

Top 15% Distinction, Waterloo National Mathematics Contest 2015, 2016, 2017
Awarded for performance in the Cayley, Fermat, and Euclid contests.

Invited Talks, Presentations, and Panels

Talks

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

Panels

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

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

Professional Activities

Workshop Organizing

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

Conference Paper Reviewing

International Conference on Machine Learning (ICML) 2022
International Conference on Learning Representations (ICLR) 2021

Journal Reviewing

Journal of Machine Learning Research (JMLR) 2022

Community Service and Leadership

FOR.ai, **Open-source Collaboration** Toronto, Canada
Research organization lead 2019 – present
Girls Who ML, **Oxford University** Oxford, United Kingdom
Workshop leader and 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
Group 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