# Winnie Xu

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## Research Experience

**Meta AI**, **Fundamental AI Research (FAIR Labs)** — New York, NY, USA
Research Scientist Intern with Dr. Karen Ullrich, Matthew Muckley & Dr. Ricky Chen — 2022-09 – ongoing
Developing ideas 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
Introduce self-referential operators for fractal data encoding, efficient compression, and controllable 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 – 2021-01
Derive variance-reducing gradient estimator and improve Neural ODE robustness through Bayesian inference w/ SDEs.
*Topics: stochastic differential equations, Bayesian neural networks, variational inference*

**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] 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.

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

[4] †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 Award**], 2022.

[3] †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.

[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
Teaching Assistant with Prof. Steve Engels. Head of content development (labs/assignments). Ran office hours.

## Academic Awards

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

**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 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.

**Best Undergraduate Research Poster**, University of Toronto 2018
Awarded to top research project in Computer Science at annual summer 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.

**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

**FOR.ai**, **Cohere** Toronto, Canada
Open research organization Community Leader 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