

RESEARCH EXPERIENCE

Google Research, Brain

Mountain View, CA, USA

Research Scientist Intern / Student Researcher with Dr. Igor Mordatch & David Dohan

2021-10 – ongoing

(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 with resolution agnostic architectures over signals.

Topics: generative & diffusion models, neural operators, Transformers, language representation, reinforcement learning

Stanford University, Stanford AI Research

Palo Alto, CA, USA

Visiting Research Scholar with Prof. Stefano Ermon

2021-06 – ongoing

(Summer 2022) Defining diffusion models on frequency domain features and learning on truncated subspaces.

(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, implicit learning

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, coresets 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

- [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] 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***, 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,” *International Conference on Machine Learning*, 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.

UNDER REVIEW

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

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

*equal contribution, †author 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 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*

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) 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 Awarded to fund the participation in the On Deck Deep Tech fellowship program.	2021
1st Place, Hack the North Awarded to top project of the year at Canada's largest Major League sponsored hackathon.	2019
1st Place, Google x BCG Hack the Globe Competition Awarded to top project of the year based on social impact and technological delivery.	2019
1st Place, Sanofi Biogenius Canada Awarded for best research project to qualify for the National Biogenius Challenge.	2017
Top 20 in Fair, Canada-Wide Science Fair Awarded for one of 20 best projects in the Senior category out of 500.	2017
Top 15% Distinction, Waterloo National Mathematics Contest Awarded for performance in the Cayley, Fermat, and Euclid contests.	2015, 2016, 2017

PROFESSIONAL ACTIVITIES

WORKSHOP ORGANIZING

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] *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 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, L^AT_EX