

RESEARCH EXPERIENCE

Meta AI, Fundamental AI Research (FAIR)

Research Scientist Intern with Dr. Karen Ullrich & Matthew Muckley
Research at the intersection of generative modeling and neural compression.
Topics: generative models, compression, information theory, representation learning

New York, NY, USA
2022-09 – ongoing

Stanford University, Stanford AI Research

Visiting Research Scholar with Prof. Stefano Ermon
(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 representation learning

Palo Alto, CA, USA
2021-06 – ongoing

Google Research, Brain

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

Mountain View, CA, USA
2021-10 – 2022-08

Vector Institute & University of Toronto

Undergraduate Researcher with Prof. David Duvenaud
Derive variance-reducing gradient estimator and improve Neural ODE robustness through Bayesian inference w/ SDEs.
Topics: stochastic differential equations, Bayesian neural networks, variational inference

Toronto, ON, Canada
2020-01 – 2021-09

Oxford University, OATML

Research Intern with Prof. Yarin Gal
Derive data efficient algorithms that leverage information theoretic proxy selection and uncertainty-aware heuristics.
Topics: Bayesian active learning, model disagreement, curriculum learning, coresnet selection

Oxford, United Kingdom
2021-01 – 2021-08

Princess Margaret Cancer Research, Computational Biology

Research Intern with Prof. Michael Hoffman
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

Toronto, ON, Canada
2018-05 – 2018-09

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*, 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.

UNDER REVIEW

- [1] 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,” Preprint, 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, 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)

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) 2022
Awarded to top undergraduate computer science researchers in North America. Finalist awarded to Top 10 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 Awarded on the basis of academic standing.	2019
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Axelrad Award , Princess Margaret Cancer Research Centre Awarded to top cancer research project in Computer Science at annual poster symposium.	2018
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Undergraduate Student Research Award , University of Toronto Awarded to fund a summer research internship in Computer Science at the University of Toronto.	2018
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HONORS

Interact Fellowship , Interact A community of mission-driven, conscientious technologists. 100 fellows selected worldwide, yearly.	2021
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Deep Tech Fellowship , On Deck Awarded to fund the participation in the On Deck Deep Tech fellowship program.	2021
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1st Place , Hack the North Awarded to top project of the year at Canada's largest Major League sponsored hackathon.	2019
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1st Place , Google x BCG Hack the Globe Competition Awarded to top project of the year based on social impact and technological delivery.	2019
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1st Place , Sanofi Biogenius Canada Awarded for best research project to qualify for the National Biogenius Challenge.	2017
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Top 20 in Fair , Canada-Wide Science Fair Awarded for one of 20 best projects in the Senior category out of 500.	2017
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Top 15% Distinction , Waterloo National Mathematics Contest Awarded for performance in the Cayley, Fermat, and Euclid contests.	2015, 2016, 2017
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PROFESSIONAL ACTIVITIES

WORKSHOP PROGRAM CHAIR

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

Research organization community lead

Toronto, Canada

2019 – present

Girls Who ML, Oxford University

Workshop leader and academic content creator

Oxford, United Kingdom

2021

Computer Science Mentorship Program, University of Toronto

Mentor to various underclassmen in Computer Science

Toronto, ON, Canada

2019 – present

Machine Intelligence Student Team (MIST), University of Toronto

Vice President of Academics

Toronto, ON, Canada

2019 – 2020

Computer Science Orientation Week, University of Toronto

Orientation Leader

Toronto, ON, Canada

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