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, Jan Brauner, Muhammed Razzak, Mrinank Sharma, Andreas Kirsch, **Winnie Xu**, Benedikt Holtgen, Adrien Morisot, 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

[2] Linqi Zhou, Michael Poli, **Xu, Winnie**, Stefano Massaroli, and Stefano Ermon, "Deep latent state space models for time-series generation," Under Review, 2023.

[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.

*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