Jacob Kelly

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Education

HBSc, University of Toronto — Toronto, ON
Computer Science, Math · ***cGPA: 3.93/4 Course Average: 90%*** — Sep 2017 – Jun 2022
Recipient of more than $19,000 in scholarships and grant funds.

Graduate Courses:	Machine Learning I & II · Deep Learning · ML for Health · Stochastic Processes Information Theory · Linear Algebra and Optimization · Math of Data Analysis
Undergrad Courses:	Advanced Algorithms & Data Structures · Advanced Differential Equations C & Systems Programming · Enriched Calculus I & II · Intro. Molecular Biology
Teaching Assistant:	STA414/2104 (Grad. Machine Learning II) · Office hours and assignment grading

Experience

Machine Learning Researcher · Python · JAX · PyTorch · Bash · Git · SLURM — Toronto, ON
Vector Institute for AI — Sep 2019 – Present
Supervisors: David Duvenaud, Richard Zemel, Roger Grosse

- Worked on regularizing Neural Ordinary Differential Equations, generative modelling with Energy Based Models, and analysis of eigenspectra using Kronecker-Factored Approximate Curvature.

Machine Learning Research Intern · Python · TensorFlow · pandas · Bash · Git — Toronto, ON
Deep Genomics — Sep 2020 – Apr 2021

- Developed framework for compressing deep convolutional splicing models with neural distillation. Resulting models matched performance across tasks and metrics while 3.7x smaller and 3.3x faster.
- Integrated knockdown and peak data with deep learning model for automated oligonucleotide design using a new biological mechanism. Developed statistical benchmarks of performance and significance.

Computational Biology Researcher · R · MATLAB · Bash · Git — Toronto, ON
Princess Margaret Cancer Research · Supervisor: Benjamin Haibe-Kains — Apr 2019 – Sep 2019

- Developed R package for benchmarking machine learning methods for inferring sample-specific gene regulatory networks from single-cell RNA sequencing (scRNA-Seq) data.

Computer Vision Software Developer · SPEL+ (internal C++ wrapper) · SVN — Markham, ON
Epson Research and Development Lab — May 2018 – Aug 2018

- Optimized motored stage movements and performed image capture and evaluation asynchronously, supporting researchers by improving speed of data collection by 58%.

Papers

1. **J. Kelly**, R. Zemel, W. Grathwohl
   "Directly Training Joint Energy-Based Models for Conditional Synthesis and Calibrated Prediction".
   ICML Workshop on Uncertainty & Robustness in Deep Learning 2021
2. W. Grathwohl*, **J. Kelly***, M. Hashemi, M. Norouzi, K. Swersky, D. Duvenaud
   "No MCMC for me: Amortized sampling for fast and stable training of energy-based models".
   International Conference on Learning Representations (ICLR) 2021
3. **J. Kelly***, J. Bettencourt*, M. J. Johnson, D. Duvenaud
   "Learning Differential Equations that are Easy to Solve".
   Neural Information Processing Systems (NeurIPS) 2020

Projects

JAX (Open-source contributor) · Python · Git — github.com/google/jax

- Top 10% of contributors (25 commits, ~ 1000 lines of code). Derived and implemented numerically stable Taylor-mode automatic differentiation rules. Wrote numerical tests and fixes for ODE solvers.

Service

NeurIPS 2021, Reviewer — 2021
IEEE Transactions on Neural Networks and Learning Systems, Reviewer — 2021
ICLR 2021 Energy-Based Models Workshop, Programme Committee (Reviewer) — 2021

Awards

Undergraduate Student Research Award, NSERC Canada — 2020
Dorothy Helen McRobb Scholarship — 2019
David L. Squires Foundation Scholarship — 2019
Margaret Ronald & Thomas Paxton Taylor Scholarship in Mathematics — 2019
Distinction (Top 15%), Euclid National Mathematics Contest, Univ. of Waterloo — 2017
Top 10, ECOO Central Ontario Programming Contest — 2017

Skills

Languages:	Python · Bash · Git · LaTeX · C/C++ · R · Java
Frameworks:	PyTorch · JAX · TensorFlow · Keras · NumPy · pandas · scikit-learn