Oren Rippel

CONTACT INFORMATION

E-mail: oren@wave.one

Website: http://www.orenrippel.com

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA, U.S.A *Sep. 2011 - June 2016*

Ph.D. in Applied Mathematics

- Research in machine learning, GPA: 5.0/5.0
- Advisor: Prof. Ryan P. Adams, Harvard University
- Thesis: *Sculpting Representations for Deep Learning*
- Worked on fundamental problems in machine learning, specifically in deep learning and Bayesian Optimization. Representation learning, optimization, scalability.

Harvard University, Cambridge, MA, U.S.A *Mar. 2012 - June 2016*

SEAS Research Fellow in Computer Science

- Ph.D. research in the Harvard Intelligent Probabilistic Systems group

University of British Columbia (UBC), Vancouver, BC, Canada *Sep. 2006 - May 2010*

B.Sc. with distinction, Combined Honours in Mathematics and Physics

- Graduation Average: 97.0%. Valedictorian.
- Thesis: *On Iizuka and Polchinski's Matrix Model for the Black Hole Information Paradox*
- Advisor: Prof. Joanna Karczmarek

SELECTED HONOURS

- NSERC Doctoral Postgraduate Scholarship (2012-2015)
- MIT Akamai Presidential Graduate Fellowship (2011)
  "MIT has established the prestigious program of Presidential Fellowships to recruit the most outstanding students worldwide to pursue graduate studies at the Institute."
- Alexander Graham Bell Canada Graduate Scholarship (2011)
- Valedictorian of UBC Science (2010; speech available on YouTube)
- 5th place in Canada in the CAP Physics University Prize Competition (2010)
- Wesbrook Scholar (2009)
  "The Wesbrook Scholars are the University's most prestigious designations, given to senior students with outstanding academic performance, leadership, and involvement in student and community activities."
- Thomas and Evelyn Hebb Memorial Scholarship in Physics (2009)
  "Given to one undergraduate in UBC, on recommendation of the Department of Physics."
- John Collison Memorial Scholarship in Mathematics (2009)
  "Given to two undergraduates in UBC, on recommendation of the Department of Mathematics."
- Science Research Award (2009)
  "Awarded to a few worthy undergraduate students with exceptional research results, to support the presentation of their results at a conference."
- NSERC Undergraduate Student Research Award (2008, 2009, 2010)
- Millennium Excellence Award: Multi-Year Renewable (2008, 2009)
  "The millennium excellence award program recognizes, supports and encourages talented Canadians who make positive and significant contributions to the betterment of their communities, demonstrate a capacity for leadership and commit themselves to the pursuit of academic excellence and innovation."

- UBC Science Scholar/Dean's Honour List standing (2007, 2008, 2009, 2010)
  "Students with a standing of 90% or better in the previous Session will receive the notation 'Science Scholar' on their records."
- AMS Tutoring Outstanding Teaching Award (2008)
- Trek Excellence Scholarship for Continuing Students (2007, 2008, 2009)
- Superior Achievement in Mathematics Award (2006)

Professional Experience

WaveOne, Inc., Mountain View, CA, U.S.A *June 2016 - present*

Co-founder and CTO

- At WaveOne, we are using machine learning to build the next generation of algorithms for digital media compression and transmission.

Facebook AI Research, Menlo Park, CA, U.S.A *June 2015 - Jan. 2016*
Research intern

- Worked in the computer vision team. Designed metric learning algorithms to construct improved image representations.

Research in Mathematics: Hydraulic Fractures *May 2010 - Oct. 2010*
With Prof. Anthony Peirce, UBC

- Developed perturbative solutions and numerical methods to solve an integral-differential system of equations

Research in Physics: Quantum Field Theory *May 2009 - May 2010*
With Prof. Joanna Karczmarek, UBC

- Studied a matrix model equivalent to the Black Hole Information Paradox across the AdS/CFT; introduced new results about the degeneracies of the spectrum of the Hamiltonian, its eigenvalue density, and the free theory coefficient mixing, in the limit of the matrix size approaching infinity

Research in Physics: Fluid Mechanics *May 2008 - Sep. 2008*
With Prof. Mark Van Raamsdonk, UBC

- Perturbed the Navier-Stokes equations using Temam's slight compressibility term; showed that all axisymmetrical vortices approach, over time, a unique characteristic solution

Leadership & Community Services

Co-founder of the BC Lower Mainland Olympiad Math Circle *Dec. 2007 - May 2010*

- Co-founded the circle under the sponsorship of the UBC Mathematics department
- In the circle, the top 20 students in BC lower mainland are given lectures regarding problem-solving strategies, and prepared towards national and international math contests
- The Circle consistently produces students that represent Canada in the International Mathematical Olympiad

Co-founder of Physics Teaching for the 21st Century *May 2009 - Jun. 2010*

- Constructed infrastructure for an extensive online database that presents various resources relevant to real-world physics, designed specifically for use by teachers and professors
- Worked with a team from the UBC Physics Department and the Teaching and Learning Enhancement Foundation

Executive Director of Meal Exchange *Aug. 2007 - Apr. 2008*

- Played a role in the establishment of the Vancouver Lower Mainland branch of Meal Exchange, a national nonprofit organization dedicated to the elimination of hunger

- Took part in recruiting and coordinating over 380 volunteers to collect 6,310 pounds of canned food, valued at $13,000, at the Trick or Eat event on Halloween

Camp Counsellor in Camp Shalom, in the Jewish Community Centre
Jun. 2007 - Aug. 2007, and Dec. 2007

- Led 6-12 year old children through a range of summer camp activities and trips

Science Frosh Leader *Sep. 2007*

- Mentored first-year students in their transition from high school to UBC

Teaching Experience

Founder of the Harvard Optimization for ML reading group *Sept. 2014 - Feb. 2015*

- Established a reading group attended by Harvard and MIT students to discuss recent work in optimization and its applications in machine learning

Teaching assistant of MIT 6.S080 Introduction to Inference *Jan. 2014 - May 2014*

- Apart from standard teaching responsibilities, developed the curriculum and corresponding recitations, problem sets and exams for this new pilot course

AMS Tutor in Mathematics and Physics *Sep. 2007 - Jan. 2008*

UBC Math 180 Differential Calculus *May 2007 - Jun. 2007*

Publications

Oren Rippel, Sanjay Nair, Carissa Lew, Steve Branson, Alexander G. Anderson, Lubomir Bourdev. *Learned Video Compression*. International Conference on Computer Vision (ICCV). 2019.

Oren Rippel and Lubomir Bourdev. *Real-Time Adaptive Image Compression*. International Conference on Machine Learning (ICML). 2017.

Oren Rippel, Manohar Paluri, Piotr Dollar and Lubomir Bourdev. *Metric Learning with Adaptive Density Discrimination*. International Conference on Learning Representations (ICLR). 2016.

Oren Rippel, Jasper Snoek and Ryan P. Adams. *Spectral Representations for Convolutional Neural Networks*. Neural Information Processing Systems (NIPS). 2015.

Jasper Snoek, Oren Rippel, Kevin Swersky, Ryan Kiros, Nadathur Satish, Narayanan Sundaram, Md. Mostofa Ali Patwary, Prabhat and Ryan P. Adams. *Scalable Bayesian Optimization Using Deep Neural Networks*. Thirty-Second International Conference on Machine Learning (ICML). 2015.

Oren Rippel, Michael A. Gelbart and Ryan P. Adams. *Learning Ordered Representations with Nested Dropout*. Thirty-First International Conference on Machine Learning (ICML). 2014.

David Duvenaud, Oren Rippel, Ryan P. Adams and Zoubin Ghahramani. *Avoiding Pathologies in Very Deep Networks*. Seventeenth International Conference on Artificial Intelligence and Statistics (AISTATS). 2014.

David Duvenaud, Oren Rippel, Ryan P. Adams and Zoubin Ghahramani. *Non-degenerate Priors for Arbitrarily Deep Networks*. NIPS workshop on Deep Learning. 2013.

Oren Rippel and Ryan P. Adams. *High-Dimensional Probability Estimation with Deep Density Models*. Technical report, arXiv:1302.5125 [stat.ML]. 2013.

Oren Rippel and Anthony Peirce. *Approximate solutions to the hydraulic fracture stress-jump problem*. Technical report. 2012.

Oren Rippel and Joanna Karczmarek. *A matrix model of the Black Hole Information Paradox: the spectrum and thermal propagator in finite N and in the large-N limit.* Honours thesis. 2010.

Patents

Oren Rippel, Sanjay Nair, Carissa Lew, Steve Branson, Alexander G. Anderson, Lubomir Bourdev. *Machine-learning based video compression* US Patent 10,860,929. 2020.

Oren Rippel, Lubomir Bourdev. *Deep learning based adaptive arithmetic coding and codelength regularization (cont.).* US Patent App. 16/918,405. 2020.

Oren Rippel, Lubomir Bourdev. *Deep learning based adaptive arithmetic coding and codelength regularization (cont.).* US Patent App. 16/918,436. 2020.

Oren Rippel, Lubomir Bourdev. *Deep learning based adaptive arithmetic coding and codelength regularization.* US Patent 10,748,062. 2020.

Oren Rippel, Sanjay Nair, Carissa Lew, Steve Branson, Alexander G. Anderson,. *Machine-learning based video compression.* Lubomir Bourdev US Patent 10,685,282. 2020.

Carissa Lew, Steve Branson, Oren Rippel, . *Adaptive quantization.* Nair, AG Anderson, Lubomir Bourdev US Patent 10,594,338. 2020.

Lubomir Bourdev, Carissa Lew, Sanjay Nair, Oren Rippel. *Autoencoding image residuals for improving upsampled images.* US Patent 10,565,499. 2020.

Oren Rippel, Lubomir Bourdev. *Dynamic control for a machine learning autoencoder.* US Patent App. 16/518,647. 2020.

Oren Rippel, Lubomir Bourdev, Carissa Lew, Sanjay Nair. *Adaptive compression based on content.* US Patent 10,402,722. 2019.

Oren Rippel, Lubomir Bourdev. *Enhanced coding efficiency with progressive representation (cont.).* US Patent App. 16/406,323. 2019.

Oren Rippel, Lubomir Bourdev. *Enhanced coding efficiency with progressive representation.* US Patent 10,332,001. 2019.

Oren Rippel, Lubomir Bourdev. *Deep learning based on image encoding and decoding.* US Patent App. 15/439,893. 2018.

Oren Rippel, Lubomir Bourdev, Carissa Lew, Sanjay Nair. *Using generative adversarial networks in compression.* US Patent App. 15/844,449. 2018.

Lubomir Bourdev, Carissa Lew, Sanjay Nair, Oren Rippel. *Data compression for machine learning tasks.* US Patent App. 15/844,447. 2018.

B Paluri, Oren Rippel, P Dollar, LD Bourdev. *Identifying Content Items Using a Deep-Learning Model.* US Patent App. 14/981,413. 2017.

Selected Talks

Observability in Dynamical Systems. Intelligent Probabilistic Systems, Harvard University, Cambridge, MA, U.S.A. 2016.

Metric Learning with Adaptive Density Discrimination. Harvard Machine Learning Tea, Harvard University, Cambridge, MA, U.S.A. 2016.

Distance Metric Learning for Convolutional Neural Networks. Facebook Artificial Intelligence Research, Facebook Inc., Menlo Park, CA, U.S.A. 2015.

Spectral Representations for Convolutional Neural Networks. Intelligent Probabilistic Systems, Harvard University, Cambridge, MA, U.S.A. 2015.

Why Tensor Rank Will Ruin Your Day. Harvard Machine Learning Tea, Harvard University, Cambridge, MA, U.S.A. 2015.

Batch Normalization for Neural Network Optimization. Harvard Machine Learning Tea, Harvard University, Cambridge, MA, U.S.A. 2014.

Convexity: Global Optimization with Local Information. Harvard Optimization for Machine Learning reading group, Harvard University, Cambridge, MA, U.S.A. 2014.

Learning Ordered Representations with Nested Dropout (video of talk available online). The 31st International Conference on Machine Learning, Beijing, China. 2014.

Towards Deep Learning On Xeon Phi. Intel collaboration, Harvard University, Cambridge, MA, U.S.A. 2014.

Markov Chain Pseudo-Atoms within General State Spaces. Intelligent Probabilistic Systems, Harvard University, Cambridge, MA, U.S.A. 2013.

Marked Poisson Processes. Intelligent Probabilistic Systems, Harvard University, Cambridge, MA, U.S.A. 2012.

An Introduction to Jeans Theory and the Formation of Structure. UBC, Vancouver, Canada. 2010.

On Iizuka and Polchinski's Matrix Model for the Black Hole Information Paradox. UBC, Vancouver, Canada. 2010.

The Black Hole Information Paradox: a Quantum-Mechanical Perspective. Canadian Undergraduate Mathematics Conference, University of Carleton, Ottawa. 2009.

An Introduction to Fluid Mechanics. Canadian Undergraduate Mathematics Conference, Toronto, Canada. 2008.

Weak and Strong Induction In Mathematics Competitions. BC Lower Mainland Olympiad Math Circle, Vancouver, Canada. 2008.

Language Proficiencies

- Fluent in English and Hebrew
- Advanced in Spanish
- Intermediate in Mandarin Chinese

Other interests

- Skiing, training in Krav Maga, hiking
- Spending time with friends and family