JAAN ALTOSAAR

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LANGUAGES

English (native), Estonian (native), French (fluent), Spanish (working)

AREAS OF SPECIALIZATION

Machine Learning • Health Care • Physics • Deep Learning • Recommender Systems

EDUCATION

2020 **Ph.D., Physics, Princeton University**. Advisors: David Blei and Shivaji Sondhi.

2015 **M.A., Physics, Princeton University**. Advisors: David Blei and Shivaji Sondhi.

2013 **B.Sc. First Class Honours in Mathematics and Physics, McGill University**
Top 10% cumulative GPA, Dean's Honour List, Dean's Multidisciplinary Undergraduate Research List

2009 **Ontario Secondary School Diploma, Hillcrest High School** (Ottawa, Canada).
Elected co-president of 1200-student body.

2007 **Higher School Certificate Years 9 & 10, Randwick Boys High School** (Sydney, Australia).
Elected class representative.

HONORS, AWARDS, & FELLOWSHIPS

2020 Princeton Physics Departmental Teaching Award

2014–2017 NSERC Doctoral Postgraduate Scholarship: ranked 3rd of 204 ($63,000)

2014 Google Summer of Code grant to work at Columbia University

2013 Julie Payette NSERC Research Scholarship: awarded to the top 24 applicants in the Canada-wide Postgraduate Scholarships M competition ($25,000)

2013 Commonwealth Scholarship, DPhil studies at University of Oxford (declined, £95,625)

2013 The Faculty of Science Moyse Travelling Scholarship, McGill University ($10,000)

2013 Delta Upsilon Graduate Scholarship, McGill University

2013 Travel award, KAUST WEP Conference

2012 First Prize for best poster, Canadian Undergraduate Physics Conference (Vancouver)

2012 Second Prize, McGill Faculty-wide Undergraduate Research Conference

2012 Third Prize, McGill Department of Physics Poster Conference

2012 NSERC Undergraduate Student Research Award

2011 NSERC Undergraduate Student Research Award

2010 NSERC Undergraduate Student Research Award

2010 Estonian Foundation of Canada Scholarship

2009 Annette S. Hill McGill Scholarship

2008 Harry Elton Memorial Award, Embassy of the People's Republic of China in Canada

WORK

2013– **Founder, Board Member, Useful Science**
Led team of 65 through launch of a non-profit science website (2M+ pageviews, 20k+ subscribers). Partnerships with Fitbit, Elsevier, and others; "won $50,000" on reality television.

2016 **Research Internship, Google AI**. Host: Eugene Brevdo
Contributed to variational inference support in TensorFlow; developed time series models.

2015 **Research Internship, DeepMind**. Host: Andriy Mnih
Work with Andriy Mnih and Koray Kavukcuoglu in the deep Learning group.

2013 **UI and UX Designer, Ottawa Hospital Research Institute**
Led UI design and testing; completed design of a federally-funded mobile app (CANImmunize) used to submit vaccination profiles to the government.

RESEARCH

2020– **Postdoctoral Research Scientist, Host: Noémie Elhadad**
***Columbia University Irving Medical Center**, Vagelos College of Physicians and Surgeons*
Machine learning for women's health, mental health, and health disparity.

2018–2020 **Visiting Researcher, Host: Kyle Cranmer**
***New York University**, Center for Data Science & Department of Physics*
Applying probabilistic modeling to study physical systems.

2014–2020 **Advisors: David Blei & Shivaji Sondhi**
***Columbia University**, Departments of Computer Science and Statistics*
***Princeton University**, Department of Physics*
Deep learning and variational inference with applications to recommender systems and physics.

2013–2014 **Advisor: Iain Couzin**
***Princeton University**, Departments of Physics, Ecology and Evolutionary Biology*
Applied machine learning techniques to study rainforest health via audio recordings. Completed 3-week field study in Costa Rica to collect rainforest audio.

2012–2013 **Advisors: Jürgen Sygusch & Anmar Khadra**
***Université de Montréal**, Department of Biochemistry*
***McGill University**, Department of Mathematics and Statistics*
Theoretical biophysics: analysis and testing of a model of biomolecular recognition.

2012 **Advisor: Michel Gingras**
***University of Waterloo**, Department of Physics and Astronomy*
Condensed matter theory: studies of the generalized dipolar spin ice model of dysprosium titanate via cumulant expansion methods for accelerating Markov Chain Monte Carlo simulations.

2011–2012 **Advisors: Walter Reisner & Moshe Szyf**
***McGill University**, Department of Physics; Department of Pharmacology & Therapeutics*
Biophysics: single-molecule DNA methylation mapping in nanochannels. Experienced with MATLAB, protein purification and binding assays, and TIRF microscopy.

2010 **Advisor: Jürgen Sygusch**
***Université de Montréal**, Department of Biochemistry*
Bioinformatics: computational high throughput screening of potential *Magnaporthe* pesticides.

PREPRINTS AND TECH REPORTS

2019 J. Altosaar, R. Ranganath, and W. Tansey. RankFromSets: Scalable Set Recommendation with Optimal Recall. *Submitted.*

2019 K. Huang, J. Altosaar, and R. Ranganath. ClinicalBERT: Modeling Clinical Notes and Predicting Hospital Readmission. *arXiv:1904.05342*.

- Featured on VentureBeat, Towards Data Science, and included in Apache MXNet

2013 J. Altosaar and J. Sygusch. The Resonant Recognition Model: long-range protein interaction via transition dipole couplings. *McGill Honours Research Project*.

2012 J. Altosaar. Detecting methylation of single molecules of DNA. *McGill Honours Thesis*.

CONFERENCE PROCEEDINGS (GOOGLE SCHOLAR)

2018 A. Dieng, J. Altosaar, R. Ranganath, and D. Blei. Noise-based regularizers for recurrent neural networks. *International Conference on Machine Learning*.

2018 J. Altosaar, R. Ranganath, and D. Blei. Proximity Variational Inference. *Artificial Intelligence and Statistics*.

2016 R. Ranganath, J. Altosaar, D. Tran, and D. Blei. Operator Variational Inference. *Neural Information Processing Systems*.

2016 D. Liang, J. Altosaar, L. Charlin, and D. Blei. Factorization meets the item embedding. *ACM Recommender Systems*.

2015 J. Zhang, A. Gerow, J. Altosaar, R. J. So, and J. A. Evans. Discovering Topic Correlation Across Arbitrary Collections. *Empirical Methods on Natural Language Processing*.

JOURNALS

2015 P. Henelius, T. Lin, M. Enjalran, Z. Hao, J. Altosaar, P. Henelius, F. Flicker, T. Yavors'kii, and M. J. P. Gingras. Refrustration and Competing Orders in a Spin Ice Material. *Phys. Rev. B.*

- Featured on Phys. Rev. B. front page.

REFEREED WORKSHOP, SYMPOSIUM, AND SHORT PAPERS

2019 J. Altosaar, R. Ranganath, and K. Cranmer. Hierarchical variational models for statistical physics. *Machine Learning and the Physical Sciences Workshop, Neural Information Processing Systems.*

2017 A. Bhatia, J. Altosaar, S. Gu. Proximity-constrained reinforcement learning. *Approximate Inference Workshop, Neural Information Processing Systems*.

2016 J. Altosaar, R. Ranganath, and D. Blei. Proximity Variational Inference. *Approximate Inference Workshop, Neural Information Processing Systems*.

2016 E. Bell, and J. Altosaar. Word embedding models applied to classical music recover the circle of fifths in embedding space. *Music Discovery Workshop, International Conference on Machine Learning*.

2015 A. J. Mercer-Taylor, and J. Altosaar. Sonification of fish movement using pitch mesh pairs. *New Interfaces for Musical Expression*.

2015 E. Benjamin, and J. Altosaar. MusicMapper: Interactive 2D representations of music samples for in-browser remixing and exploration. *New Interfaces for Musical Expression.*

- Featured and interviewed on The Wire magazine.

TECHNICAL WRITING

2017 J. Altosaar. *How does physics connect to machine learning?*
Average time on page: 8 min across 30k pageviews.

2016 J. Altosaar. *Variational autoencoder tutorial*.
Average time on page: 10 min, across 300k pageviews. Used as a reference in courses at the University of Toronto and New York University.

ADVISING

Work with Master's and undergraduate students has resulted in several publications.

2020 Rohan Bansal (Central High School, Missouri)
2017 Abhishek Bhatia (M.Sc. '18, Columbia University)
2016 Eamonn Bell (Ph.D. '18, Columbia University)
2014 Ethan Benjamin (M.Sc. '14, Columbia University)
2014 Jingwei Zhang (M.Sc. '14, Columbia)
2014 Andrew James Mercer-Taylor (B.Sc. '15, Columbia University)
2014 Anjishnu Kumar (M.Sc. '14, Columbia University)
2014 Tony Paek (M.Sc. '15, Columbia University)
2014 Drishan Arora (M.Sc. '14, Columbia University)

TEACHING

2019–2020 **Assistantship in Instruction, Princeton** Teaching assistant for PHY301: Thermal Physics.
2018–2020 **Assistantship in Instruction, Princeton** Teaching assistant for PHY525: Introduction to Condensed Matter Physics.
2018 **Instructor, Summer Program on Applied Rationality and Cognition** (https://sparc-camp.org/)
Taught machine learning and emotional intelligence to high schoolers. Rated easiest to connect with by students. Sample anonymous student feedback:

- "particularly easy to approach"
- "I am impressed and inspired by the weird things you are willing to do in front of everyone else and your ability to totally disregard shame."
- "I genuinely appreciate your honesty and desire to communicate the idea that it's okay to say "I don't know" all the time."

Spring 2014 **Instructor, Princeton Splash.** Taught high school students; average rating 4.38/5 teaching quality.
Winter 2013 **Teaching Assistant, McGill University**. Applied Linear Algebra (Prof. Adam Oberman)
Winter 2012 **Teaching Assistant, McGill University.** Honours Complex Variables (Prof. Robert Seiringer)
Fall 2011 **Teacher, Montreal Estonian Society Kindergarten**
Fall 2011 **Mentor, McGill University Buddy Program**

PUBLIC SPEAKING

2020 Probabilistic modeling in support of science. *Caltech; University of California, Irvine*
2018 Food recommendation with deep exponential families. Keynote. *North Star AI Conference, Estonia*
2017 Proximity Variational Inference. *Bloomberg L.P. Machine Learning Group*
2017 food2vec. *New York Times, Machine Learning & Cooking editorial teams; Northeastern University*
2016 Machine learning seminar: Operator Variational Inference. *Imperial College, London*
2016 Machine Intelligence Research Institute Colloquium Series on Robust and Beneficial AI
2016 Comparing Domains of Improvisation. *Columbia University*
2015 Dragons' Den demo day, *Canadian Broadcasting Corporation*
2012 Canadian Undergraduate Physics Conference, *University of British Columbia*

SERVICE

Reviewer	JMLR; NeurIPS '16–'20; ICML '17, '19, '20; AAAI '18; ICLR '17–'21; AISTATS '18–'21; PLOS ONE '17; Consciousness and Cognition '17; Advances in Approximate Bayesian Inference '15–'20; NeurIPS Machine Learning and the Physical Sciences Workshop '19–'20; NeurIPS Machine Learning for Health '20; NeurIPS Algorithmic Fairness through the Lens of Causality and Interpretability '20
Admissions	Princeton Physics Open House Committee '14

SELECTED POSTERS

2017	New York Academy of Sciences, Proximity Variational Inference
2014	ComSciCon: Communicating Science, *Harvard University: ranked top 50 of 870 applicants*
2012	[2]Canadian Undergraduate Physics Conference, *University of British Columbia* *First Prize for best poster*
2012	[2]Faculty of Science Undergraduate Research Conference, *McGill University* *Second Prize: induction to Sigma Xi Society*
2012	[2]Department of Physics Poster Conference, *McGill University* *Third Prize: travel award for Canadian Undergraduate Physics Conference*
2011	[1]Department of Physics Poster Conference, *McGill University – Honourable Mention* [2]*Poster: How stuffing leads to novel behaviour in spin ice* [1]*Poster: DNA methylation mapping in nanochannels*

SCIENCE OUTREACH

2017	FIRST LEGO League regional robotics competition judge, *Brooklyn, NY*
2014	Hopewell Elementary School science fair judge

PROFESSIONAL ASSOCIATIONS

Association for Computing Machinery, Institute of Physics, Sigma Xi Scientific Society, American Association for the Advancement of Science, Institute of Mathematical Statistics

ACTIVITIES & INTERESTS

1996–	Classical and jazz piano, electronic music production
2010–	Mentor, McGill University Mentorship Program for First-Year Students
2014–2015	Resident Graduate Student, Wilson College, Princeton University. Taught weekly meditation.
2012	University of Waterloo Choir (Director: Professor Gerard Yun)
2011	Milton Park Recreation Association Beach Volleyball
2010	Montreal Estonian Society Kindergarten Teacher
2009–2010	Meditation (Enpuku-ji Zen Center, Abbess Zengetsu Myōkyō)
2009	McGill Choral Society (Director: Mary-Jane Puiu)

SELECTED PRESS

2019 VentureBeat, "AI predicts hospital readmission rates from clinical notes"
2016 Editorial, The Conversation, "Accurate science or accessible science in the media – why not both?"
2016 Interview, The Wire magazine
2016 MusicMappr featured on Prosthetic Knowledge blog
2015 Featured on Dragons' Den
2015 In Training, "Medical Student Startup Improves Science Communication"
2014 Reddit front page
2014 Boing Boing, "Useful Science, accessible by all"
2014 Lifehacker, "Excel shortcuts, article summaries, and web notes"
2014 Fitbit corporate blog, "7 science-backed numbers to improve your life"
2014 New Zealand Herald, "10 top sites to visit this weekend"
2014 AweSci, "A chat with Jaan Altosaar from Useful Science"
2014 IT World, "Useful Science headlines that apply to your weird little computer life"
2014 McGill Tribune, "Useful Science bridges communication gap in research"
2014 McGill News, Alumni Magazine, "Better living through science"
2014 Betakit, "McGill grad launches curated list of science articles"
2014 CBC Radio, Spark episode on Sciencescape