JAAN ALTOSAAR

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🌐 https://jaan.io

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

AREAS OF SPECIALIZATION

Machine Learning • Theoretical Physics • Biophysics • Deep Learning • Language Models

EDUCATION

2015-2019	**Ph.D., Physics**. Advisors: David Blei and Shivaji Sondhi. *Princeton University*, Princeton, New Jersey, United States of America
2018	**Visiting researcher**. Host: Kyle Cranmer *New York University*, New York, New York, United States of America
2013-2015	**M.A., Physics**. Advisors: David Blei and Shivaji Sondhi. *Princeton University*, Princeton, New Jersey, United States of America
2009-2013	**B.Sc. First Class Honours in Mathematics and Physics** *McGill University*, Montreal, Quebec, Canada *Top 10% cumulative GPA, Dean's Honour List, Dean's Multidisciplinary Undergraduate Research List*
2007-2009	**Ontario Secondary School Diploma** *Hillcrest High School*, Ottawa, Ontario, Canada. Honours, Co-President of 1200-student body
2006-2007	**Higher School Certificate Years 9 & 10** *Randwick Boys High School*, Sydney, New South Wales, Australia

HONORS, AWARDS, & FELLOWSHIPS

2014	Google Summer of Code: Topic modeling LaTeX on the arXiv
2014-2017	NSERC Doctoral Postgraduate Scholarship: ranked 3rd of 204 (Princeton, $63,000)
2013	Julie Payette NSERC Research Scholarship: awarded to the top 24 applicants in the Canada-wide Postgraduate Scholarships M competition (Ottawa, $25,000)
2013	Commonwealth Scholarship, DPhil studies at University of Oxford (declined)
2013	The Faculty of Science Moyse Travelling Scholarship, McGill University
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	Elected to Sigma Xi Society
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	Estonian Foundation of Canada Scholarship
2010	NSERC Undergraduate Student Research Award
2009	Annette S. Hill McGill Scholarship

WORK EXPERIENCE

5/2016-9/2016   **Software Engineering Intern,** Google Brain (Mountain View, CA). Host: Eugene Brevdo
Research internship; variational inference in TensorFlow.

5/2015-9/2015   **Software Engineering Intern,** DeepMind (London, UK). Host: Andriy Mnih
Research internship, Deep Learning group.

11/2013-   **Founder,** Useful Science (http://usefulscience.org)
Led team of 65 through launch of a non-profit science website (700k+ hits, 15k+ subscribers). Partnered with Fitbit, "won $50,000" on Dragons' Den.

5/2013-8/2013   **UI and UX Designer, Ottawa Hospital Research Institute**
Led UI design and testing; completed the design of Canada's vaccinations mobile app used to submit vaccination profiles to the government. My designs are still in use: demo (140k+ users).

RESEARCH EXPERIENCE

4/2014-   **Advisors:** David Blei & Shivaji Sondhi
Columbia University, Departments of Computer Science and Statistics
Princeton University, Department of Physics
Combining Bayesian inference with deep learning to model LaTeX equations and other time series; recommendation systems.

9/2013-4/2014   **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.

9/2012-7/2013   **Advisors:** Jürgen Sygusch & Anmar Khadra
Université de Montréal, Department of Biochemistry
McGill University, Department of Mathematics and Statistics
Theoretical biophysics: analysis and testing of the Resonant Recognition Model as a potential theory of biomolecular recognition.

5/2012-8/2012   **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 implemented within Monte Carlo simulations.

5/2011-4/2012   **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.

5/2010-8/2010   **Advisor:** Jürgen Sygusch
Université de Montréal, Department of Biochemistry
Bioinformatics: computational high throughput screening of potential *Magnaporthe* pesticides.

RESEARCH ADVISING

Summer 2017	Abhishek Bhatia (M.Sc. '18, Columbia University)
Spring 2016	Eamonn Bell (Ph.D. '18, Columbia University)
Fall 2014	Ethan Benjamin (M.Sc. '14, Columbia University)
Fall 2014	Jingwei Zhang (M.Sc. '14, Columbia)
Fall 2014	Andrew James Mercer-Taylor (B.Sc. '15, Columbia University)
Fall 2014	Anjishnu Kumar (M.Sc. '14, Columbia University)
Fall 2014	Tony Paek (M.Sc. '15, Columbia University)
Fall 2014	Drishan Arora (M.Sc. '14, Columbia University)

TEACHING EXPERIENCE

Fall 2018   **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 courses on 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 several mini courses to local high school students.

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**

INVITED TALKS

2018	Food recommendation with deep exponential families. *North Star AI Conference, Estonia*
2017	Proximity Variational Inference. *Bloomberg L.P. Machine Learning Group*
2017	food2vec. *Northeastern University, Albert-László Barabási group*
2017	food2vec. *New York Times, Machine Learning & Cooking editorial teams*
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*
2013	Montreal Startup Club presentation on the Immunize Canada app, *Rho Canada Ventures*
2012	Department of Physics Undergraduate Student Symposium, *McGill University*
2012	Canadian Undergraduate Physics Conference, *University of British Columbia*

TECHNICAL WRITING

2017   J. Altosaar. *How does physics connect to machine learning?*
16k pageviews, average time on page: 9 min.

2016   J. Altosaar. *Variational autoencoder tutorial*.
82k pageviews, average time on page: 10 min. Used as a reference in courses at schools like the University of Toronto (link) and New York University (link).

PUBLICATIONS

2018   A. Dieng, J. Altosaar, R. Ranganath, and D. Blei. Noise-based regularizers for recurrent neural networks.

2018   J. Altosaar, R. Ranganath, and D. Blei. Proximity Variational Inference. *AISTATS 2018*.

2017   A. Bhatia, J. Altosaar, S. Gu. Proximity-constrained reinforcement learning. *Approximate Inference Workshop, NIPS 2017*

2016   J. Altosaar, R. Ranganath, and D. Blei. Proximity Variational Inference. *Approximate Inference Workshop, NIPS 2016*.

2016   R. Ranganath, D. Tran, J. Altosaar, and D. Blei. Operator Variational Inference. *NIPS 2016*.

2016   D. Liang, J. Altosaar, L. Charlin, and D. Blei. Factorization meets the item embedding. *Submitted to Recsys 2016*.

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

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*.

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.

2015   A. J. Mercer-Taylor, and J. Altosaar. Sonification of fish movement using pitch mesh pairs. *NIME*.

2015   E. Benjamin, and J. Altosaar. MusicMapper: Interactive 2D representations of music samples for in-browser remixing and exploration. *NIME 2015*.
● Featured and interviewed on The Wire magazine.

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

SELECTED POSTERS

2017   NIPS Approximate Inference Workshop, Proximity-constrained reinforcement learning

2017   New York Academy of Sciences, Proximity Variational Inference

2016   NIPS, Operator Variational Inference

2016   NIPS Approximate Inference Workshop, Proximity Variational Inference

2016   ICML Music Discovery Workshop

2016   Rec'Sys, Factorization Meets the Item Embedding

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: nomination and 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

2014	Hopewell Elementary School science fair judge
2014	Princeton Physics Open House Committee

PROFESSIONAL ASSOCIATIONS

Reviewer for: JMLR, NIPS, ICML, AAAI, ICLR, AISTATS, PLOS ONE, Consciousness and Cognition
Member: 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
2014-2015	Resident Graduate Student, Wilson College, Princeton University
2012	University of Waterloo Choir (Director: Professor Gerard Yun)
2011	Milton Park Recreation Association Beach Volleyball
2009-2010	Meditation (Enpuku-ji Zen Center, Abbess Zengetsu Myōkyō)
2010	Mentor with McGill University Mentorship Program for First-Year Students
2010	Montreal Estonian Society Kindergarten Teacher
2009	McGill Choral Society (Director: Mary-Jane Puiu)

SELECTED PRESS

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