

JAAN ALTOSAAR

Department of Physics, Princeton University
Office: 307 Jadwin Hall
Princeton, New Jersey 08540

✉ altosaar@princeton.edu
🌐 <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

- 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. Altsosaar, L. Charlin, and D. Blei. Factorization meets the item embedding. *Submitted to Recsys 2016*.
- 2016 E. Bell, and J. Altsosaar. 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. Altsosaar, 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. Altsosaar, 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. Altsosaar. Sonification of fish movement using pitch mesh pairs. *NIME*.
- 2015 E. Benjamin, and J. Altsosaar. MusicMapper: Interactive 2D representations of music samples for in-browser remixing and exploration. *NIME 2015*.
 • Featured and interviewed on [The Wire magazine](#).
- 2012 J. Altsosaar. 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 ²Canadian Undergraduate Physics Conference, *University of British Columbia*
First Prize for best poster
- 2012 ²Faculty of Science Undergraduate Research Conference, *McGill University*
Second Prize: induction to Sigma Xi Society
- 2012 ²Department of Physics Poster Conference, *McGill University*
Third Prize: nomination and award for Canadian Undergraduate Physics Conference
- 2011 ¹Department of Physics Poster Conference, *McGill University - Honourable Mention*
²Poster: *How stuffing leads to novel behaviour in spin ice*
¹Poster: *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

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