

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 • 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

- 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

EXPERIENCE

- 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 EXPERIENCE

- 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.

RESEARCH ADVISING

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

- 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 EXPERIENCE

- 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

- 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. *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 CANImmune app, *Rho Canada Ventures*
- 2012 Department of Physics Undergraduate Student Symposium, *McGill University*
- 2012 Canadian Undergraduate Physics Conference, *University of British Columbia*

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 C. 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](#).

SERVICE

- Reviewer JMLR '18; NeurIPS '16-'19; ICML '17, '19, '20; AAAI '18; ICLR '17-'20; AISTATS '18-'20; PLOS ONE '17; Consciousness and Cognition '17; NeurIPS Approximate Inference Workshop '15-'18; NeurIPS Machine Learning and the Physical Sciences Workshop '19
- 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 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: travel award for Canadian Undergraduate Physics Conference
- 2011 ¹Department 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 Pui)

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