

Abraham Frandsen

Curriculum Vitae

Raleigh, North Carolina

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Education

- 2016–Present **Ph.D. Candidate, Computer Science, Duke University.**
Advisor: Rong Ge
Expected Date of Graduation: Spring 2021
- 2013–2016 **M.S. Mathematics, Cum Laude, Brigham Young University.**
Advisor: Jeffrey Humpherys
- 2007–2013 **B.S. Mathematics, Summa Cum Laude, Brigham Young University.**

Research Agenda

I work on **theoretical machine learning**, with the aim to advance rigorous mathematical understanding and principled algorithms. I study problems in unsupervised and **representation learning** as well as **control theory** and **reinforcement learning**. In the past, I have studied applied machine learning methods for healthcare.

Publications

- 2020 Frandsen, A., Ge, R. (2020). *Optimization Landscape of Tucker Decomposition*. Mathematical Programming (2020). <https://doi.org/10.1007/s10107-020-01531-z>
- 2020 Frandsen, A., Ge, R. (2020). *Extracting Latent State Representations with Linear Dynamics from Rich Observations*. arXiv preprint arXiv:2006.16128. <https://arxiv.org/abs/2006.16128>
- 2019 Frandsen, A., Ge, R. (2019). *Understanding Composition of Word Embeddings via Tensor Decomposition*. ICLR 2019. <https://arxiv.org/abs/1902.00613>
- 2018 Christensen, T., Frandsen, A., Glazier, S., Humpherys, J., Kartchner, D. (2018). *Machine learning methods for disease prediction with claims data*. IEEE International Conference on Healthcare Informatics (ICHI) 2018. <https://ieeexplore.ieee.org/abstract/document/8419439>
- 2012 Frandsen, A., Sampson, D., Steinburg, N. (2012). *Isoperimetric surfaces with boundary, II*. Pacific Journal of Mathematics 2012. <https://msp.org/pjm/2012/259-2/p03.xhtml>

Masters Thesis

- 2016 **Machine Learning for Disease Prediction**
Advisor: Jeffrey Humpherys
<https://scholarsarchive.byu.edu/etd/5975/>

Teaching and Academic Activities

- 2020 **Graduate Teaching Assistant, Duke Department of Computer Science**
Graduate T.A. for undergraduate algorithms course
Tasks: office hours, recitation lectures, grading

- 2019 **Special Year on Optimization, Statistics, and Machine Learning**, Institute for Advanced Study
Student visitor to the program for Fall 2019
Participated in workshops, seminars, and working group discussions with experts in theoretical machine learning
- 2019 **International Conference on Learning Representations (ICLR) 2019**, New Orleans, Louisiana
Presented poster for “Understanding Composition of Word Embeddings via Tensor Decomposition”
- 2017 **Simons Institute Workshop on Representation Learning**, Berkeley, California
Participant in week-long workshop with other scholars in the area of representation learning and machine learning
- 2017 **Graduate Teaching Assistant**, Duke Department of Computer Science
Head graduate T.A. for undergraduate algorithms course
Tasks: office hours, recitation lectures, grading, helped improve lecture notes
Received **Outstanding Teaching Award**
- 2016 **Graduate Teaching Assistant**, Duke Department of Computer Science
Graduate T.A. for graduate machine learning course
Tasks: office hours, recitation lectures, grading, helped create assignments and exams
- 2015 **NeurIPS 2015 Workshop on Machine Learning for Healthcare**, Montreal, Canada
Presented poster on Master’s Thesis: Machine Learning for Disease Prediction
- 2013-2016 **Curriculum Development**, BYU Department of Mathematics
Critical team member in developing the Applied and Computational Math Emphasis program. On this team, I helped shape the curriculum for a four-semester track in the math program. I created many lab assignments on a variety of topics in applied math and machine learning, and edited sections of textbook manuscripts.
- 2013-2016 **Graduate Teaching Assistant**, BYU Department of Mathematics
T.A. for multiple semesters for the Applied and Computational Math program
Received **Outstanding Teaching Award**
- 2011 **Summer Research Experience for Undergraduates in Mathematics**, BYU
Conducted collaborative research on non-Euclidean geometry, award-winning presentation at 2011 Math Fest Conference in Lexington, Kentucky
- 2008-2012 **Math Lab Teaching Assistant**, BYU Department of Mathematics
Worked as a lab T.A. for multiple semesters, helping hundreds of students in several undergraduate math courses

Professional Activities

- 2019 **AAAI-20**, Program Committee Member
- 2019 **NeurIPS 2019**, Reviewer
- 2019 **ICML 2019**, Reviewer

Work

- 2020 **Amazon Applied Science Intern**
- 2019 **Geometric Data Analytics Intern**, Durham, North Carolina
Collaborated on developing new featurization techniques for sequential data
Environment: Python (NumPy, pandas, scikit-learn), git

- 2015 **Intermountain Healthcare Intern**, Salt Lake City, Utah
Applied machine learning techniques on large-scale healthcare data for disease prediction
Environment: Python (pandas, gensim, NumPy), SQL
- 2012 **NSA Director's Summer Program Intern**, Fort Meade, Baltimore
Premier summer program for undergraduate students in math and computer science
Designed and evaluated natural language data classification systems
Environment: Python

Programming Skills

Python

Numerical computing: NumPy, SciPy, CVXOPT
Data Science and Machine Learning: pandas, scikit-learn
Deep Learning: TensorFlow, PyTorch
Natural Language Processing: gensim, NLTK

Other Technologies

Git, L^AT_EX, SQL

Awards and Honors

- 2007-2013 **Dean's List**, BYU
Awarded for every eligible semester
- 2008 **Utah Governor's Scholar**
One of 23 top college students in state of Utah
- 2007 **Presidential Scholarship**, BYU
Top academic award for incoming BYU undergraduates
- 2006 **National Merit Scholar**
Annual academic award earned by <1% of entrants

Personal

Lover of mountain biking, classical music, and jazz
Fluent in German