

# Fredrik D. Johansson

Postdoctoral Associate  
Massachusetts Institute of Technology  
CSAIL & IMES  
45 Carleton St, E25-545D. Cambridge, MA 02142, USA

fredrikj@mit.edu, ml@fredjo.com  
www.mit.edu/~fredrikj

---

## RESEARCH INTERESTS

My research is focused on advancing machine learning methods and theory to improve decision making. I have also worked on machine learning for use with graph data, reinforcement learning, algorithmic fairness and natural language processing.

## APPOINTMENTS

2017– **Postdoctoral Associate**  
Institute for Medical Eng. & Science, and CSAIL. Massachusetts Institute of Technology.  
Advisor: David Sontag

## EDUCATION

2017 **Ph.D.** Computer Science & Engineering. Chalmers University of Technology, Sweden.  
Advisor: Devdatt Dubhashi. Thesis: *Learning with Geometric Embeddings of Graphs*

2012 **M.Sc.** Computer Science & Engineering. Chalmers University of Technology, Sweden.

2010 **B.Sc.** Engineering Physics. Chalmers University of Technology, Sweden.

## VISITING POSITIONS

2015 **Visiting Research Scholar**  
Clinical Machine Learning Group. Department of Computer Science, New York University.  
Advisor: David Sontag

Columbia Machine Learning Lab. Department of Computer Science, Columbia University.  
Advisor: Tony Jebara.

## PUBLICATIONS

Conference proceedings are the main form of publication in machine learning. The International Conference on Machine Learning (ICML), Neural Information Processing Systems (NIPS), and the ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD), with acceptance rates at 20–25%, are considered the top venues for machine learning and data mining research respectively.

### PEER REVIEWED JOURNAL ARTICLES

- 1 N. Tahmasebi, L. Borin, G. Capannini, D. Dubhashi, P. Exner, M. Forsberg, Gerhard Gossen, F. D. Johansson, R. Johansson, M. Kågebäck, O. Mogren, P. Nugues, T. Risse. Visions and Open Challenges for a Knowledge-Based Culturomics. *International Journal on Digital Libraries*, 2015.

#### PEER REVIEWED CONFERENCE CONTRIBUTIONS

- 2 I. Chen, F D. Johansson, D. Sontag. Why is my classifier discriminatory? Accepted to *Proc. of Neural Information Processing Systems, NIPS*, 2018. Awarded spotlight talk.
- 3 U. Shalit, F D. Johansson, D. Sontag. Estimating individual treatment effect: generalization bounds and algorithms. In *Proc. of the International Conference on Machine Learning, ICML*, 2017
- 4 A. Panahi, D. Dubhashi, F D. Johansson, C. Bhattacharyya. Clustering by Sum of Norms: Stochastic Incremental Algorithm, Convergence and Cluster Recovery. In *Proc. of the International Conference on Machine Learning, ICML*, 2017
- 5 F D. Johansson, U. Shalit, D. Sontag. Learning Representations for Counterfactual Inference. In *Proc. of the International Conference on Machine Learning, ICML*, 2016
- 6 F D. Johansson, A. Chatteraj, C. Bhattacharyya, D. Dubhashi. Weighted Theta Functions and Embeddings with Applications to Max-Cut, Clustering and Summarization. In *Proc. of Neural Information Processing Systems, NIPS*, 2015.
- 7 L. Hermansson, F D. Johansson and O. Watanabe Generalized Shortest Path Kernel on Graphs. In *Proc. of the International Conference on Discovery Science*, 2015.
- 8 F. Johansson, D. Dubhashi. Learning with similarity functions on graphs using matchings of geometric embeddings. In *Proc. of the International Conference on Knowledge Discovery and Data Mining, KDD*, 2015.
- 9 F. Johansson, V. Jethava, D. Dubhashi, C. Bhattacharyya. Global graph kernels using geometric embeddings. In *Proc. of the International Conference on Machine Learning, ICML*, 2014.
- 10 F. Axelsson, B. Rydback, F. Johansson, J. Bengtsson, S. Marinov. Data-driven Coreference Resolution for Swedish. In *Proc of the Swedish Language Technology Conference, SLTC*, 2014.
- 11 T. Kerola, L. Hermansson, F. Johansson, V. Jethava, D. Dubhashi. Entity Disambiguation in Anonymized Graphs Using Graph Kernels. In *Proc of the International Conference on Information and Knowledge Management, CIKM* 2013.

#### PEER-REVIEWED WORKSHOP CONTRIBUTIONS

- 12 M. Kågebäck, F. Johansson, R. Johansson, D. Dubhashi. Neural context embeddings for automatic discovery of word senses. In *Proc. of NAACL-HLT*, 2015.
- 13 F. Johansson, V. Jethava, D. Dubhashi. DLOREAN: Dynamic LOcation- aware REconstruction of multiWay Networks. In *Proc. of the International Conference on Data Mining Workshops, ICDM-W*, 2013.
- 14 F. Johansson, T. Färdig, V. Jethava, and S. Marinov. Intent-aware temporal query modeling for keyword suggestion. In *Proc of the International Conference on Information and Knowledge Management Workshops, CIKM-W*, 2012.

#### INVITED CONFERENCE CONTRIBUTIONS

- 15 F D. Johansson, O. Frost, C. Retzner, and D. Dubhashi Classifying large graphs with differential privacy. In *Proc of Modeling Decisions for Artificial Intelligence, MDAI*, 2015.

#### PRE-PRINTS IN SUBMISSION

- 16 O. Gottesman, F D. Johansson, et al. Evaluating Reinforcement Learning Algorithms in Observational Health Settings. In arXiv preprint arXiv:1805.12298, 2018.
- 17 F D. Johansson, N. Kallus, U. Shalit, D. Sontag. Learning Weighted Representations for Generalization Across Designs. In *arXiv preprint arXiv:1802.08598*, 2018.

#### REPORTS

- 18 E. Jorge, M. Kågebäck, F D. Johansson, E. Gustavsson. Learning to Play Guess Who? and Inventing a Grounded Language as a Consequence. In arXiv preprint arXiv: 1611.03218, 2016.

#### OTHER PUBLICATIONS

- 19 F D. Johansson. Learning with geometric embeddings of graphs. *Doctoral Thesis*, 2017
- 20 F D. Johansson. Query Concept Interaction over Time. *MSc Thesis*, 2012

## PEDAGOGICAL ACHIEVEMENTS

### TEACHING EXPERIENCE

#### Massachusetts Institute of Technology

- 2018 Causal Inference & Deep Learning (Graduate level). Co-developer & lecturer. Course within the MIT IAP format with  $\sim 70$  students.
- MIT Beavers Works Summer Institute (High-school level). Guest lecture: Clinical Machine Learning

#### Cornell Tech

- 2017 Causality and Learning for Intelligent Decision Making (Graduate level). Guest-lecture: Estimating Individual Treatment Effect: Generalization Bounds & Algorithms.

#### Columbia University

- 2015 Introduction to Machine Learning (Undergraduate level). Guest-lecture: Support Vector Machines & Kernels

#### Chalmers University of Technology

- 2016 Deep Learning (Graduate level). Co-developer & lecturer. Flipped classroom format with  $\sim 30$  students.
- 2015–2016 Algorithms for Machine Learning and Inference (Graduate level). Practice leader & guest lecturer.
- 2012–2016 Algorithms (Graduate level). Practice leader.
- 2012–2014 Algorithms, Advanced Course (Graduate level). Practice leader.
- 2013–2014 Data structures (Undergraduate level). Practice leader.

## STUDENT SUPERVISION

**Undergraduate Research Opportunities Program (UROP). MIT.**

2018 Suchan Vivatsethachai. Discovering clinical practice variation.  
Primary supervisor

Christina Ji. Sequential Decision Making in Healthcare.  
Primary supervisor

**MSc. Theses. Chalmers University of Technology.**

2015 Henrik Alburg. Tracking temporal evolution in word meaning with distributed word representations.  
Primary supervisor

Jonatan Kilhamn. Fast shortest-path kernel computations using approximate methods.  
Primary supervisor

Kristoffer Tapper. Learning to rank, a supervised approach for ranking of documents.  
Primary supervisor

2014 F Axelsson & B Rydback. Data-driven Coreference Resolution for Swedish.  
Assistant supervisor. *Thesis work presented at SLTC '14*

Otto Frost & Carl Retzner. Graph Classification with Differential Privacy.  
Primary supervisor. *Thesis work published in MDAI '15*

2013 Linus Hermansson & Tommi Kerola. Entity Disambiguation in Anonymized Graphs Using Graph Kernels.  
Assistant supervisor. *Thesis work published in CIKM '13*

## PEDAGOGICAL QUALIFICATIONS

Course: Teaching, Learning and Evaluation 3 HEC, Chalmers University of Technology

## RESEARCH GRANTS AND FUNDS

2017 MIT-IBM Watson AI Lab. Exploratory Proposal: *Making Interpretable Causal Estimation of Individual Effect into a Science: Addressing the U. S. Opioid Epidemic and Other Health Policies.* Co-wrote the application. Main applicant: David Sontag.

MIT-IBM Watson AI Lab. Exploratory Proposal: *Learning Optimal Dynamic Treatment Strategies from Temporal ICU Monitoring Data.* Co-wrote the application. Main applicant: David Sontag.

Roche-Genentech Project Grant. In collaboration with Brigham & Women's hospital. *Finding the Target Population for Tocilizumab Monotherapy in Rheumatoid Arthritis.* Co-wrote the application. Main applicant: David Sontag.

Office of Naval Basic Research Challenge: *Predictive and Causal Modeling—Bridging the Gap*.  
Co-wrote the application. Main applicant: David Sontag.

- 2015 Sverige-Amerika Foundation Fellowship  
Funded research visits for 6 months at Columbia and NYU.

## PROFESSIONAL ACTIVITIES

### TALKS & PRESENTATIONS

#### INVITED TALKS

- 2018 UMass Amherst Learning and Friends Lunch  
*Machine Learning for Estimating Causal Effects*
- Atlantic Causal Inference Conference, Pittsburgh  
*Empirical Investigations of Methods for Treatment Effect Heterogeneity*
- Atlantic Causal Inference Conference, Pittsburgh  
*Counterfactual prediction & Domain Adaptation in High Dimensions*
- Broad Institute, Cambridge MA  
*Causal Inference Primer*
- 2016 Deep Learning Symposium, NIPS. (Invited as co-author. Did not give talk.)  
*Learning representations for counterfactual inference*
- Machine Learning—What, how and why? Göteborg Science Festival, Göteborg
- Machine Learning Seminars, Linköping University, Sweden  
*What if...? Machine Learning and Causal Inference.*
- Machine Learning Workshop, Chalmers University of Technology  
*Introduction to Machine Learning*

#### CONFERENCE PRESENTATIONS

- 2017 International Conference on Machine Learning  
*Estimating individual treatment effect: generalization bounds and algorithms*
- International Conference on Machine Learning  
*Clustering by Sum of Norms: Stochastic Incremental Algorithm, Convergence and Cluster Recovery*
- 2016 International Conference on Machine Learning  
*Learning representations for counterfactual inference*
- 2015 International Conference on Knowledge Discovery & Data Mining  
*Learning with similarity functions on graphs using matchings of geometric embeddings*

- 2014 International Conference on Machine Learning  
*Global graph kernels using geometric embeddings*
- 2013 International Conference on Information & Knowledge Management  
*Entity disambiguation in anonymized graphs using graph kernels*

#### CONFERENCE POSTER PRESENTATIONS

- 2015 International Conference on Neural Information Processing Systems  
*Weighted theta functions and embeddings with applications to max-cut, clustering and summarization*

#### WORKSHOP ORGANIZER

- 2018 Beyond Prediction: Counterfactual Evaluation, Learning, and Intervention. Co-organizer.  
Workshop proposal in submission to *NIPS 2018*.

#### STUDENT VOLUNTEER

- 2015 The 21st Conference of Knowledge Discovery and Data Mining, (KDD)
- 2014 International Conference on Machine Learning (ICML)

#### PEER-REVIEW SERVICE (SELECTED)

Journal of Machine Learning Research (JMLR)  
Uncertainty in Artificial Intelligence (UAI)  
International Conference on Artificial Intelligence and Statistics (AISTATS)  
Association for the Advancement of Artificial Intelligence (AAAI)  
Neural Information Processing Systems (NIPS)  
International Conference on Machine Learning (ICML)  
International Conference on Knowledge Discovery and Data Mining (KDD)  
European Conference on Machine Learning and Principles and Practice of Knowledge Discovery.

#### REFERENCES

David Sontag, Massachusetts Institute of Technology, USA  
*Postdoctoral advisor*

Devdatt Dubhashi, Chalmers University of Technology, Göteborg, Sweden  
*Doctoral advisor*

Finale Doshi-Velez, Harvard University, USA  
Chiranjib Bhattacharyya, Indian Institute of Science, Bangalore, India  
Nathan Kallus, Cornell Tech, USA