

# Fredrik D. Johansson

## Assistant professor

Chalmers University of Technology  
Computer Science & Engineering  
412 96 Göteborg, Sweden

`fredrik.johansson@chalmers.se`  
`www.fredjo.com`

---

## RESEARCH INTERESTS

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

## APPOINTMENTS

- 2019– **Assistant Professor**  
Computer Science & Engineering. Chalmers University of Technology, Sweden.
- 2017–2019 **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

### PEER-REVIEWED JOURNAL ARTICLES

- 1 N. Kriege, F D. Johansson, C. Morris, A Survey on Graph Kernels. *Applied Network Science*, 5(1), pp.1-42, 2020.

- 2 F D. Johansson, Machine Learning Analysis of Heterogeneity in the Effect of Student Mindset Interventions. *Observational Studies* 5, 71–82, 2019.
- 3 O. Gottesman, F D. Johansson, et al. Guidelines for reinforcement learning in healthcare. *Nature Medicine* 25 (1), 16–18, 2019.
- 4 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

- 5 Maggie Makar, Fredrik D. Johansson, John Gutttag, David Sontag Estimation of Bounds on Potential Outcomes For Decision Making. In *Proc. of the International Conference on Machine Learning, ICML*, 2020 (To appear).
- 6 FD. Johansson, D. Wei, M. Oberst, T. Gao, G. Brat, D. Sontag, KR. Varshney. Characterization of Overlap in Observational Studies. In *Proc. of Artificial Intelligence and Statistics, AISTATS*, 2020. (To appear)
- 7 J Collins, F Johansson, S Gale, S Kim, S Shrestha, D Sontag, J Stratton, T Huong, C Xu, E Losina, D Solomon. Predicting Remission Among Patients With Rheumatoid Arthritis Starting Tocilizumab Monotherapy: Model Derivation and Validation Using Conventional Regression and Machine Learning. *Annals of the Rheumatic Diseases* 2019;78:727, 2019.
- 8 F D. Johansson, D. Sontag, R. Ranganath. Support and Invertibility in Domain-Invariant Representations. In *Proc. of Artificial Intelligence and Statistics, AISTATS*, 2019.
- 9 I. Chen, F D. Johansson, D. Sontag. Why is my classifier discriminatory? In *Proc. of Neural Information Processing Systems, NeurIPS*, 2018. Awarded spotlight talk.
- 10 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
- 11 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
- 12 F D. Johansson, U. Shalit, D. Sontag. Learning Representations for Counterfactual Inference. In *Proc. of the International Conference on Machine Learning, ICML*, 2016
- 13 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, NeurIPS*, 2015.
- 14 L. Hermansson, F D. Johansson and O. Watanabe Generalized Shortest Path Kernel on Graphs. In *Proc. of the International Conference on Discovery Science*, 2015.
- 15 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.
- 16 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.

- 17 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.
- 18 L. Hermansson, T. Kerola, 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

- 19 M. Kågebäck, F. Johansson, R. Johansson, D. Dubhashi. Neural context embeddings for automatic discovery of word senses. In *Proc. of NAACL-HLT*, 2015.
- 20 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.
- 21 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

- 22 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.

#### TECHNICAL REPORTS

- 23 FD. Johansson. Machine Learning Analysis of Heterogeneity in the Effect of Student Mindset Interventions. In *arXiv preprint arXiv:1811.05975*, 2018.
- 24 F D. Johansson, N. Kallus, U. Shalit, D. Sontag. Learning Weighted Representations for Generalization Across Designs. In *arXiv preprint arXiv:1802.08598*, 2018.
- 25 O. Gottesman, FD. Johansson, et al. Evaluating Reinforcement Learning Algorithms in Observational Health Settings. In *arXiv preprint arXiv:1805.12298*, 2018.
- 26 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

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

## PEDAGOGICAL ACHIEVEMENTS

### TEACHING EXPERIENCE

#### Chalmers University of Technology

- |      |  |
|------|--|
| 2020 | Design of AI systems (MSc course). Co-developer & lecturer.<br>Developed and delivered the majority of lectures and assignments. |
| 2016 | Deep Learning (PhD course). Co-developer & lecturer.<br>Flipped classroom format with ~30 students.                              |

- 2015–2016 Algorithms for Machine Learning and Inference (Graduate level). Practice leader & guest lecturer.
- 2012–2016 Algorithms (MSc course). Practice leader.
- 2012–2014 Algorithms, Advanced Course (MSc course). Practice leader.
- 2013–2014 Data structures (BSc course). Practice leader.

#### **Massachusetts Institute of Technology**

- 2019 Machine Learning for Healthcare (Graduate level).  
Guest lecture: Reinforcement learning
- 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

### **STUDENT SUPERVISION**

#### **PhD Students.**

- 2019– Emil Carlsson. Chalmers University of Technology.  
Co-supervisor

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

- 2019 Suchan Vivatsethachai. Discovering clinical practice variation.  
Primary supervisor
- 2019 David Amirault. Bounding epistemic uncertainty in causal estimation  
Primary supervisor
- 2018 Christina Ji. Sequential Decision Making in Healthcare.  
Primary supervisor

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

- 2020 Samuel Håkansson, Viktor Lindblom. Efficient search for effective treatments
- 2020 Hakon Valur, Hildur Egilsdottir. Artificial Intelligence for Clinical Diagnostics in Alzheimer's disease
- 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

2020 FORMAS. Poverty traps in Afrika. Funding: 3M SEK over 3 years. (Co-applicant)

2019 WASP-AI/Math PhD Project. Knut och Alice Wallenbergs Stiftelse. Funding: 1 PhD Student salary (4 years)

2018 WASP-AI/MLX Professorship. Knut och Alice Wallenbergs Stiftelse. Funding: Own salary (4 years), 2 PhD Student salaries (4 years), 2 Post-doc salaries (2 years).

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 EXPERIENCE

### CONSULTING SERVICES

- 2019 Advisor at Human Longevity, Inc. Advise the data science team on problems related to healthcare and causal inference.

### CONFERENCE & WORKSHOP ORGANIZATION

- 2020 Conference on Uncertainty in Artificial Intelligence (UAI)  
Publication chair
- 2020 3rd Swedish AI Society Workshop (SAIS)  
Program chair
- 2018 Beyond Prediction: Counterfactual Evaluation, Learning, and Intervention.  
Workshop proposal submitted to *NeurIPS 2018*. Co-organizer.

### TUTORIALS

- 2019 Causality & Causal Inference. *WASP Summer School, Stockholm*. Developed and delivered a 3-hour tutorial for 50–60 PhD students in the WASP graduate school.

### INVITED TALKS & PRESENTATIONS

#### INVITED TALKS (SELECTED)

- 2019 Seminar at the Division of Systems and Control, Uppsala University, Sweden  
*Machine Learning, Causality & Decision-making*
- Joint Statistical Meeting (JSM), Denver, Colorado  
*Machine Learning and Overlap in Observation Studies*
- Harvard Center for Population and Dev Studies Lunch Seminar, Boston, MA  
*Machine Learning for Causal Effect Estimation*
- 2018 Harvard School of Public Health Luncheon Seminar, Cambridge  
*Causal Effects and Overlap in High Dimensions*
- Microsoft Research Machine Learning Seminar, Seattle  
*Causal Effects and Overlap in High Dimensions*
- IBM Causal Inference Workshop, Cambridge  
*Causal Effects and Overlap in High Dimensions*
- UMass Amherst Learning and Friends Lunch, Amherst  
*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, NeurIPS. (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*

Göteborg Film Festival Panel, Chalmers University of Technology  
*Panel on Turing AI & The Imitation Game*

## CONFERENCE PRESENTATIONS (SELECTED)

- 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*

## 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 (NeurIPS)

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.

Last updated: June 17, 2020