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   Samuel Håkansson, Viktor Lindblom, Omer Gottesman, Fredrik D. Johansson. Learning to search efficiently for causally near-optimal treatments. In *Proc. of Neural Information Processing Systems*, NeurIPS, 2020 (To appear).

6   Maggie Makar, Fredrik D. Johansson, John Guttag, David Sontag. Estimation of Bounds on Potential Outcomes For Decision Making. In *Proc. of the International Conference on Machine Learning*, ICML, 2020.

7   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.

8   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.

9   F D. Johansson, D. Sontag, R. Ranganath. Support and Invertibility in Domain-Invariant Representations. In *Proc. of Artificial Intelligence and Statistics*, AISTATS, 2019.

10   I. Chen, F D. Johansson, D. Sontag. Why is my classifier discriminatory? In *Proc. of Neural Information Processing Systems*, NeurIPS, 2018. Awarded spotlight talk.

11   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

12   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

13   F D. Johansson, U. Shalit, D. Sontag. Learning Representations for Counterfactual Inference. In *Proc. of the International Conference on Machine Learning*, ICML, 2016

14   F D. Johansson, A. Chattoraj, 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.

15   L. Hermansson, F D. Johansson and O. Watanabe Generalized Shortest Path Kernel on Graphs. In *Proc. of the International Conference on Discovery Science*, 2015.

16 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.

17 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.

18 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.

19 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

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

21 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.

22 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

23 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

24 FD. Johansson Machine Learning Analysis of Heterogeneity in the Effect of Student Mindset Interventions. In *arXiv preprint arXiv:1811.05975*, 2018.

25 F D. Johansson, N. Kallus, U. Shalit, D. Sontag. Learning Weighted Representations for Generalization Across Designs. In *arXiv preprint arXiv:1802.08598*, 2018.

26 O. Gottesman, FD. Johansson, et al. Evaluating Reinforcement Learning Algorithms in Observational Health Settings. In *arXiv preprint arXiv:1805.12298*, 2018.

27 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

28 F D. Johansson. Learning with geometric embeddings of graphs. *Doctoral Thesis*, 2017

29 F D. Johansson. Query Concept Interaction over Time. *MSc Thesis*, 2012

Pedagogical Achievements

Teaching experience

Chalmers University of Technology

2020	Causality & causal inference (PhD course). Developer & lecturer. Developed and delivered all lectures and assignments.
2020	Design of AI systems (MSc course). Co-developer & lecturer. Developed and delivered the majority of lectures and assignments.
2016	Deep Learning (PhD course). Co-developer & lecturer. 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 ∼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.

2020–	Newton Mwai. Chalmers University of Technology. Main supervisor
2020–	Adam Breitholtz. Chalmers University of Technology. Main supervisor
2020–	Lena Stempfle. Chalmers University of Technology. Main supervisor
2020–	Anton Matsson. Chalmers University of Technology.

Main supervisor

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   Vetenskapsrådet. Kombinera satelliter och artificiell intelligens för att mäta fattigdom mellan 1982-2020 och använda dessa data för att förklara effekterna av Världsbankens och Kinesiska utvecklingsprogram i Afrika. Funding: 18M SEK over 6 years. (Co-applicant)

DSRE Seed project. Observatory of poverty – Harnessing machine intelligence to detect African poverty and inequality from satellite images. Funding: 300 kSEK (Co-applicant)

CHAIR Seed grant. Poverty traps in Afrika. Funding: 3M SEK over 3 years. (Co-applicant)

CHAIR Seed grant. AI and Missingness in Diagnostics for Alzheimer's Disease. 300 kSEK (PI)

CHAIR Seed grant. Yata – Intelligent systems to improve and support education. 300 kSEK (Named collaborator)

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)

2020   Biotech Atelier
       Machine Learning for predicting progression of Alzheimer's disease

       Vetenskapsfestivalen, Gothenburg
       Algoritmer som beslutsstöd—Är det rättvist?

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: December 8, 2020