Fredrik D. Johansson

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

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

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

2023–	**Associate Professor**	
	Computer Science & Engineering. Chalmers University of Technology, Sweden.	
2019–2023	**Assistant Professor**	
	Computer Science & Engineering. Chalmers University of Technology, Sweden.	
2021–	**Scientific advisor, Management group**	
	Chalmers AI Research Centre	
2021–2023	**Profile leader: Digitalization, Big Data & AI**	
	Health Engineering Area of Advance, Chalmers	
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.

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   A Daoud, FD Johansson. The impact of austerity on children: Uncovering effect heterogeneity by political, economic, and family factors in low-and middle-income countries. *Social Science Research*, 2024.

2   DH Solomon, H Guan, FD Johansson, L Santacroce, W Malley, L Guo, H Litman. Assessing clusters of comorbidities in rheumatoid arthritis: a machine learning approach. *Arthritis Research & Therapy*, 2024.

3   A Matsson, D H. Solomon, M M. Crabtree, R W. Harrison, H J. Litman, F D. Johansson. Patterns in the Sequential Treatment of Patients With Rheumatoid Arthritis Starting a Biologic or Targeted Synthetic Disease-Modifying Antirheumatic Drug: 10-Year Experience From a US-Based Registry. *ACR Open Rheumatology*, 2023.

4   A Daoud, F Jordán, M Sharma, F Johansson, D Dubhashi, S Paul, Subhashis B. Using Satellite Images and Deep Learning to Measure Health and Living Standards in India. *Social Indicators Research*, 2023.

5   S Ek, D Zachariah, FD Johansson, P Stoica. Off-Policy Evaluation with Out-of-Sample Guarantees. *Transactions on Machine Learning Research*, TMLR, 2023.

6   NM Kinyanjui, E Carlsson, FD Johansson. Fast Treatment Personalization with Latent Bandits in Fixed-Confidence Pure Exploration. *Transactions on Machine Learning Research*, TMLR, 2023.

7   A Breitholtz & FD Johansson. Practicality of generalization guarantees for unsupervised domain adaptation with neural networks. *Transactions on Machine Learning Research*, TMLR, 2022.

8   FD Johansson, U Shalit, N Kallus, D Sontag, Generalization Bounds and Representation Learning for Estimation of Potential Outcomes and Causal Effects. *Journal of Machine Learning Research* JMLR, 2022.

9   HV Dansson, L Stempfle, H Egilsdóttir, A Schliep, E Portelius, K Blennow, H Zetterberg, F D Johansson, Predicting Progression & Cognitive Decline in Amyloid-Positive Patients with Alzheimerś Disease. *Alzheimer's Research & Therapy*, 2021.

10   Johansson, F.D., Collins, J.E., Yau, V., Guan, H., Kim, S.C., Losina, E., Sontag, D., Stratton, J., Trinh, H., Greenberg, J. and Solomon, D.H., Predicting Response to Tocilizumab Monotherapy in Rheumatoid Arthritis: A Real-World Data Analysis Using Machine Learning. *The Journal of Rheumatology*, 2021.

11   Solomon, D.H., Xu, C., Collins, J., Kim, S.C., Losina, E., Yau, V. and Johansson, F.D., The sequence of disease-modifying anti-rheumatic drugs: pathways to and predictors of tocilizumab monotherapy. *Arthritis Research & Therapy*, 23(1), pp.1-9, 2021.

12   JE Collins, FD Johansson, S Gale, S Kim, S Shrestha, D Sontag, J Stratton, H Trinh, C Xu, E Losina, DH Solomon *ACR open rheumatology*, 2(2), pp.65-73, 2021.

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

14   F D. Johansson, Machine Learning Analysis of Heterogeneity in the Effect of Student Mindset Interventions. *Observational Studies 5, 71–82*, 2019.

15   O Gottesman, F Johansson, M Komorowski, A Faisal, D Sontag, F Doshi-Velez, L A Celi, Guidelines for reinforcement learning in healthcare. *Nature Medicine* 25 (1), 16–18, 2019.

16   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

17   L Stempfle, FD Johansson. MINTY: Rule-based Models that Minimize the Need for Imputing Features with Missing Values. In *The 27th International Conference on Artificial Intelligence and Statistics*, AISTATS (To appear), 2024.

18   E Carlsson, D Basu, FD Johansson, D Dubhashi. Pure Exploration in Bandits with Linear Constraints. In *The 27th International Conference on Artificial Intelligence and Statistics*, AISTATS (To appear), 2024.

19   CT Jerzak, FD Johansson & A Daoud. Image-based Treatment Effect Heterogeneity. *Causal Learning and Reasoning*, CLeaR, 2023.

20   MB Pettersson, M Kakooei, J Ortheden, FD Johansson, A Daoud. Time series of satellite imagery improve deep learning estimates of neighborhood-level poverty in africa. In *Proceedings of the Thirty-Second International Joint Conference on Artificial Intelligence*, IJCAI, 2023.

21   L Stempfle & FD Johansson. Sharing Pattern Submodels for Prediction with Missing Values. T*Proc. of the 37th AAAI Conference on Artificial Intelligence*, AAAI, 2023.

22   B Jung & FD Johansson. Efficient learning of nonlinear prediction models with time-series privileged information. In *Proc. of Neural Information Processing Systems*, NeurIPS, 2022.

23   A Matsson, FD Johansson. Case-based off-policy policy evaluation using prototype learning. In *Uncertainty in Artificial Intelligence*, UAI, 2022.

24   N Mwai Kinyanjui, FD Johansson. ADCB: An Alzheimer's disease simulator for benchmarking observational estimators of causal effects. In *Proceedings of Conference on Health, Inference, and Learning*, CHIL, 2022.

25   R Karlsson, M Willbo, Z Hussain, RG Krishnan, D Sontag, FD Johansson. Using Time-Series Privileged Information for Provably Efficient Learning of Prediction Models. In *The 25th International Conference on Artificial Intelligence and Statistics*, AISTATS, 2022.

26   E Carlsson, D Dubhashi, FD Johansson. Learning Approximate and Exact Numeral Systems via Reinforcement Learning. In *Proceedings of the Annual Meeting of the Cognitive Science Society*, CogSci, 2021.

27   E Carlsson, D Dubhashi, FD Johansson. Thompson Sampling for Bandits with Clustered Arms. In *Proceedings of the Thirtieth International Joint Conference on Artificial Intelligence*, IJCAI, 2021.

28 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.

29 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.

30 M. Oberst, FD. Johansson, D. Wei, T. Gao, G. Brat, D. Sontag, KR. Varshney. Characterization of Overlap in Observational Studies. In *Proc. of Artificial Intelligence and Statistics*, AISTATS, 2020.

31 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.

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

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

34 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

35 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

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

37 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.

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

39 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.

40 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.

41 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.

42 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.

Invited conference contributions

43 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

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

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

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

47 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

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

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

Pedagogical Achievements

Teaching experience

Chalmers University of Technology

2020–   Causality & causal inference (MSc 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 student 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.

2023–   Alessandro Margueritte. Chalmers University of Technology.
Main supervisor

2023–   Ahmet Balcioglu. Chalmers University of Technology.
Main supervisor

2023–   Herman Bergström. Chalmers University of Technology.
Main supervisor

2021–   Tobias Karlsson. Chalmers University of Technology.
Co-supervisor

2021–2023   Mena Nadum. Chalmers University of Technology.
Main supervisor

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). Massachusetts Institute of Technology

2019   Suchan Vivatsethachai. Discovering clinical practice variation.

2019	David Amirault. Bounding epistemic uncertainty in causal estimation
2018	Christina Ji. Sequential Decision Making in Healthcare.

MSc Theses (selected out of 20+ groups). Chalmers University of Technology.

2022	Bastian Jung. Efficient learning with privileged information in nonlinear time series Primary supervisor. *Thesis work published in NeurIPS '22*
2021	Rickard Karlsson, Martin Willbo. Learning using Privileged Time Series Primary supervisor. *Thesis work published in AISTATS '22*
2020	Samuel Håkansson, Viktor Lindblom. Efficient search for effective treatments Primary supervisor. *Thesis work published in NeurIPS '20*
2020	Hakon Valur, Hildur Egilsdottir. Artificial Intelligence for Clinical Diagnostics in Alzheimer's disease Primary supervisor. *Thesis work published in Alzheimer's Research & Therapy*
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

Diploma in Teaching and Learning in Higher Education (Chalmers University of Technology)

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

Supervising research students 3 HEC, Chalmers University of Technology

Supervising writing processes 2.5 HEC, Chalmers University of Technology

Pedagogical project 5 HEC, Chalmers University of Technology

Theoretical perspectives on learning 2.5 HEC, Chalmers University of Technology

Diversity and inclusion for learning in higher education 2 HEC, Chalmers University of Technology

Reflections on Teaching and Learning in Higher Education 0.5 HEC

Research grants and funds

2022   Vetenskapsrådet Starting Grant. Kausalitet of sidoinformation för effektiv maskininlärning. Funding: 4 MSEK.

2020   WASP-AI Collaboration Project. Knut och Alice Wallenbergs Stiftelse. Funding: 2 PhD Student, 1 industry PhD student. (4 years) Co-PI with Uppsala University & Astra Zeneca.

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   Formas. Poverty traps in Africa. Funding: 3 MSEK (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

2023   Conference on Uncertainty in Artificial Intelligence (UAI)
Workflow chair

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

2023   Causal Machine Learning. *Probabilistic AI Summer School, Trondheim, Norway*. Developed and delivered a 3-hour tutorial about causal inference for $\approx$ 100 PhD students.

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)

2023   Seminar at the KTH Royal Institute of Technology
Sample-efficient and domain-robust machine learning using privileged information

2023   ML Seminar, Technion, Israel Institute of Technology
Sample-efficient and domain-robust machine learning using privileged information

2023   SCS Seminar, Brigham and Women's hospital
Machine learning with auxiliary variables: Improving sample efficiency and domain generalization

2022   Pacific Causal Inference Conference
Efficient learning using privileged information with known causal structure

UR Samtiden (National public broadcaster)
Hur lär sig maskiner att lösa problem med AI?

Inria Soda Seminar
Causal effects, generalization bounds and learned representations

2021   Falsterbo-Skytts Rotaryklubb
Artificiell intelligens i vården

WASP4All
Making the most of machine learning for better decisions

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

Editorial work

Action editor, Transactions of Machine Learning Research (TMLR)

Program committee (reviewer or area chair)

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.

Volunteer

2015   The 21st Conference of Knowledge Discovery and Data Mining, (KDD)

2014   International Conference on Machine Learning (ICML)