Curriculum Vitæ of Niklas Wahlström

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Name:	Niklas Wahlström
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	SWEDEN
Phone:	+46-70-512 23 49
E-mail:	niklas.wahlstrom@it.uu.se
Born:	May 14, 1984
Citizenship:	Swedish

Academic Degrees

December 2015 — **Doctor of Philosophy in Automatic Control, Linköping University**
Thesis: *Modeling of Magnetic Fields and Extended Objects for Localization Applications*
Supervisor: Prof. Fredrik Gustafsson

March 2013 — **Licentiate of Engineering in Automatic Control, Linköping University**
Thesis: *Localization Using Magnetometers and Light Sensors*
Supervisor: Prof. Fredrik Gustafsson

June 2010 — **Master of Science in Applied Physics and Electrical Engineering - International, Linköping University**
Specialization in engineering mathematics, automatic control and German language. Received the "Trygve Holm Medal" for best point average (highest grade in all courses).
Thesis: *Target Tracking Using Maxwell's Equations*

Work Experience

2019 – **Assistant Professor, Department of Information Technology, Uppsala University**
Research topics include machine learning, deep learning and statistical signal processing.

2016 –2019 **Postdoctoral Researcher, Department of Information Technology, Uppsala University**

2010 – 2015 **PhD student, Department of Electrical Engineering, Linköping University**
Research topics included machine learning, extended target tracking, statistical signal processing, sensor fusion, filtering and estimation.

2006-2009 **Teaching assistant, Department of Mathematics, Linköping University**
Was responsible for exercise sessions in basic courses in calculus, linear algebra and optimization.

2009 **Developer (summer intern), Bombardier Transportation, Zürich, Switzerland**
Developed a simulation model of a surveillance system for transformers in trains.

2006, 2007 **Software tester (summer intern), Sectra Imtec AB, Linköping, Sweden**
Worked with verification of Sectra Imtec's software system for editing, reviewing och storing of digital X-ray pictures.

Other Merits

2020 - **Board member** Master's program in image analysis and machine learning, Uppsala University.

2021 **Board member (co-opted)** Master's program in sociotechnical systems engineering, Uppsala University.

2017 - 2021 **Co-founder and board member of Stylaero AB, Linköping**
Have together with former colleges at Linköping University, an entrepreneur and an investor founded the company Stylaero AB providing the next evolution of human-computer interaction. The core technology of the company is based on my research on 3D positioning of magnetic objects.

Spring 2014	**Research visit, Imperial College, London**
	Worked on modeling and control of high-dimensional time series by combining concepts from automatic control and machine learning. Supervisor: Dr. Marc Deisenroth, Department of Computing.
2007–2008	**Exchange student, Swiss Federal Institute of Technology, Zürich, Switzerland**
	Studied the third year of my undergraduates studies abroad. Attended courses in electrical engineering, applied/theoretical physics, mathematics and programming.
2006–2007	**Marketing director in IAESTE's local chapter, Linköping**
	Was involved in projects to provide qualified work experience abroad for graduates.
2005	**Spanish course in Guatemala**
	Learned Spanish as a part of a course and a volunteer project.
2004	**Military service as music soldier in the Royal Swedish Army Band, Strängnäs**
	Was the leader of the clarinet section and in part also of the orchestra as its consertmaster.

Awarded grants

| 2022-2025 | **Swedish Research Council (VR)**. Starting grant within natural and engineering sciences. Project: *Physics-informed machine learning*. Individual grant. |
| 2020-2024 | **Knut and Alice Wallenberg Foundation (WASP)**. Industrial PhD project: *Modular neural networks and meta learning in 6G networks*. Joint with: Jalil Taghia (Ericsson AB) |

Publications

8 peer-reviewed journal papers, 21 peer-reviewed conference papers, 1 book, 1 patent Google Scholar h-index 18, citations: 1255.
All publications are available from `http://www.it.uu.se/katalog/nikwa778/publications`.

Theses

[PhD]	Niklas Wahlström. *Modeling of Magnetic Fields and Extended Object for Localization Applications*. PhD thesis, Linköping University, Automatic Control, December 2015.
[Lic]	Niklas Wahlström. *Localization using Magnetometers and Light Sensors*. Licentiate's thesis, Linköping University, Automatic Control, March 2013.
[MSc]	Niklas Wahlström. Target tracking using Maxwell's equations. Master's thesis, Linköping University, Automatic Control, June 2010.

Books

| [B1] | Andreas Lindholm, Niklas Wahlström, Fredrik Lindsten, and Thomas B. Schön. *Machine Learning - A First Course for Engineers and Scientists*. Cambridge University Press, 2022. |

Journal Papers

Articles published in peer reviewed international journals listed in reverse chronological order.

[J8]	Philipp Pilar, Carl Jidling, Thomas B. Schön, and Niklas Wahlström. Incorporating sum constraints into multitask Gaussian processes. *Transactions on Machine Learning Research*, 2022.
[J7]	Zenith Purisha, Carl Jidling, Niklas Wahlström, Thomas B. Schön, and Simo Särkkä. Probabilistic approach to limited-data computed tomography reconstruction. *Inverse Problems*, 35(10):105004, 2019.
[J6]	Carl Jidling, Johannes Hendriks, Niklas Wahlström, Alexander Gregg, Thomas B. Schön, Christopher Wensrich, and Adrian Wills. Probabilistic modelling and reconstruction of strain. *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms*, 436:141 – 155, 2018.
[J5]	Arno Solin, Manon Kok, Niklas Wahlström, Thomas B. Schön, and Simo Särkkä. Modeling and interpolation of the ambient magnetic field by Gaussian processes. *IEEE Transactions on Robotics*, 34(4):1112 – 1127, 2018.

[J4]   Gustaf Hendeby, Fredrik Gustafsson, Niklas Wahlström, and Svante Gunnarsson. A Platform for Teaching Sensor Fusion Using a Smartphone. *International Journal of Engineering Education*, 33(2B):781–789, 2017.

[J3]   Niklas Wahlström and Emre Özkan. Extended target tracking using Gaussian processes. *IEEE Transactions on Signal Processing*, 63(16):4165–4178, 2015.

[J2]   Niklas Wahlström, Roland Hostettler, Fredrik Gustafsson, and Wolfgang Birk. Classification of driving direction in traffic surveillance using magnetometers. *IEEE Transactions on Intelligent Transportation Systems*, 15(4):1405–1418, 2014.

[J1]   Niklas Wahlström and Fredrik Gustafsson. Magnetometer modeling and validation for tracking metallic targets. *IEEE Transactions on Signal Processing*, 62(3):545–556, 2014.

Conference Papers

Conference papers published in peer reviewed international conferences listed in reverse chronological order.

[C21]   Daniel Gedon, Antonio H. Ribeiro, Niklas Wahlström, and Thomas B. Schön. First steps towards self-supervised pretraining of the 12-lead ECG. In *Proceedings of the 48th Computing in Cardiology Conference (CinC)*, Virtual conference, September 2021.

[C20]   Carl Andersson, Niklas Wahlström, and Thomas B. Schön. Learning deep autoregressive models for hierarchical data. In *19th IFAC Symposium on System Identification (SYSID)*, Virtual conference, July 2021.

[C19]   Daniel Gedon, Niklas Wahlström, Thomas B. Schön, and Lennart Ljung. Deep state space models for nonlinear system identification. In *19th IFAC Symposium on System Identification (SYSID)*, Virtual conference, July 2021.

[C18]   Carl Andersson, Antonio H. Ribeiro, Koen Tiels, Niklas Wahlström, and Thomas B. Schön. Deep convolutional networks in system identification. In *IEEE 58th Conference on Decision and Control (CDC)*, pages 3670–3676, Nice, France, December 2019.

[C17]   Carl Andersson, Niklas Wahlström, and Thomas B. Schön. Data-driven impulse response regularization via deep learning. In *Proceedings of the 18th IFAC Symposium on System Identification (SYSID)*, Stockholm, Sweden, 2018.

[C16]   Carl Jidling, Niklas Wahlström, Adrian Wills, and Thomas B. Schön. Linearly constrained Gaussian processes. In *Advances in Neural Information Processing Systems 30 (NIPS)*, pages 1215–1224, Long Beach, CA, US, December 2017.

[C15]   Emre Özkan, Niklas Wahlström, and Simon J. Godsill. Rao-blackwellised particle filter for star-convex extended target tracking models. In *19th International Conference on Information Fusion (FUSION)*, Heidelberg, Germany, July 2016.

[C14]   Francesca Ceragioli, Gustav Lindmark, Clas Veibäck, Niklas Wahlström, Martin Lindfors, and Claudio Altafini. A bounded confidence model that preserves the signs of the opinion. In *European Control Conference*, Aalborg, Denmark, June 2016.

[C13]   John-Alexander M. Assael, Niklas Wahlström, Thomas B. Schön, and Marc P. Deisenroth. Data-efficient learning of feedback policies from image pixels using deep dynamical models. In *Deep Reinforcement Learning Workshop at the Annual Conference on Neural Information Processing Systems (NIPS)*, Montréal Canada, December 2015.

[C12]   Niklas Wahlström, Thomas B. Schön, and Marc P. Deisenroth. Learning deep dynamical models from image pixels. In *Proceedings of the 17th IFAC Symposium on System Identification (SYSID)*, Bejing, China, October 2015.

[C11]   Niklas Wahlström, Thomas B. Schön, and Marc P. Deisenroth. From pixels to torques: Policy learning with deep dynamical models. In *Deep Learning Workshop at the International Conference on Machine Learning (ICML)*, Lille, France, July 2015.

[C10]   Niklas. Wahlström, Patrik Axelsson, and Fredrik Gustafsson. Discretizing stochastic dynamical systems using Lyapunov equations. In *Proceedings of the The 19th World Congress of the International Federation of Automatic Control (IFAC)*, pages 3726–3731, Cape Town, South Africa, August 2014.

[C9]   Gustaf Hendeby, Fredrik Gustafsson, and Niklas Wahlström. Teaching Sensor Fusion and Kalman Filtering using a Smartphone. In *Proceedings of the The 19th World Congress of the International Federation of Automatic Control (IFAC)*, pages 10586–10591, Cape Town, South Africa, August 2014.

[C8]   Viktor Deleskog, Hans Habberstad, Gustaf Hendeby, David Lindgren, and Niklas Wahlström. Robust NLS sensor localization using MDS initialization. In *Proceedings of 17th International Conference on Information Fusion (FUSION)*, Madrid, Spain, July 2014

[C7]   Niklas Wahlström, Manon Kok, Thomas B. Schön, and Fredrik Gustafsson. Modeling magnetic fields using Gaussian processes. In *Proceedings of the the 38th International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 3522–3526, Vancouver, Canada, May 2013.

[C6]   Manon Kok, Niklas Wahlström, Thomas B. Schön, and Fredrik Gustafsson. MEMS-based inertial navigation based on a magnetic field map. In *Proceedings of the 38th International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 6466–6470, Vancouver, Canada, May 2013.

[C5]   Niklas Wahlström, Fredrik Gustafsson, and Susanne Åkesson. A Voyage to Africa by Mr Swift. In *Proceedings of the 15th International Conference on Information Fusion (FUSION)*, pages 808–815, Singapore, July 2012.

[C4]   Niklas Wahlström, Roland Hostettler, Fredrik Gustafsson, and Wolfgang Birk. Rapid classification of vehicle heading direction with two-axis magnetometer. In *Proceedings of the International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pages 3385–3388, Kyoto, Japan, March 2012.

[C3]   Niklas Wahlström, Jonas Callmer, and Fredrik Gustafsson. Single target tracking using vector magnetometers. In *Proceedings of the International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pages 4332–4335, Prague, Czech Republic, May 2011.

[C2]   Niklas Wahlström, Jonas Callmer, and Fredrik Gustafsson. Magnetometers for tracking metallic targets. In *Proceedings of 13th International Conference on Information Fusion (FUSION)*, Edinburgh, Scotland, July 2010.

[C1]   Erik Almqvist, Daniel Eriksson, Andreas Lundberg, Emil Nilsson, Niklas Wahlström, Erik Frisk, and Mattias Krysander. Solving the ADAPT benchmark problem - A student project study. In *21st International Workshop on Principles of Diagnosis (DX-10)*, Portland, Oregon, USA, October 2010.

Patents

[P1]   Fredrik Gustafsson and Niklas Wahlström. Method and device for pose tracking using vector magnetometers, March 2019. Patent.

Teaching Experience

2023	Course responsible and lecturer, **Introduction to Computer Control Systems** (3rd year, 1 occasion), Uppsala University
2022	Responsible for lab module, **Modelling of dynamical systems** (2nd year, 1 occasion), Uppsala University
2019–2021	Course responsible, examiner, lecturer and course developer, **Advanced probabilistic machine learning** (4-5th year, 3 occasions), Uppsala University
2019, 2021	Course responsible, examiner, lecturer and course developer, **Deep learning** (PhD course, 2 occasions), Uppsala University
2017-2022	Lecturer, teaching assistant and developer, **Statistical machine learning** (3-4th year, 7 occasions), Uppsala University
2016	Teaching assistant, **Automatic Control II** (4th year, 1 occasions), Uppsala University
2012–2013	Teaching assistant and course developer **Sensor Fusion** (4-5th year, 2 occasions) Linköping University
2011	Supervisor, **Control Project Laboratory** (3rd year, 1 occasion), Linköping University
2010-2014	Teaching assistant, **Optimal Control** (4-5th year, 3 occasions), Linköping University
2010-2011	Teaching assistant, **Automatic Control** (3rd year, 2 occasions), Linköping University
2009	Teaching assistant, **Optimization** (2nd year, 1 occasion), Linköping University
2007-2008	Supplemental instructor, **Calculus** (1st year, 2 occasions), Linköping University
2006, 2009	Mentor, **Linear Algebra** (1st year, 2 occasions), Linköping University

Presentations and Lectures

Linearly constrained Gaussian processes. SIAM Conference on Uncertainty Quantification (online), April 2022

Linearly and nonlinearly constrained Gaussian processes. Lifting Inference with Kernel Embeddings (LIKE22) – Winter school and workshop (online), January 2022

Physics-informed machine learning, Celsius-Linnaeus Symposium, Uppsala University, February 2021.

Constrained Gaussian processes for Strain field reconstruction, The 3rd Sheffield Workshop on Structural Dynamics, December 2020.

AI och fysiken, part of seminar celebrating the 20 years anniversary of the IT department, Uppsala University, January 2020.

Deep Learning applied to System Identification, Deep structures (workshop), Aalto University, December 2019.

Guest lecture about magnetic tracking and mapping in the course Electromagnetism I, Uppsala University, May 2019.

Invited seminar about my PhD thesis [PhD] at the Swedish Defence Research Agency, Linköping, December 2018.

Pose tracking of magnetic objects, Presentation at the VASCO workshop, Uppsala University. February 2018.

Pose tracking of magnetic objects, Seminar at the group of Visual Information and Interaction (Vi2), Uppsala University. November 2017.

Guest lecture about Deep Learning in the course Empirical Modeling, Uppsala University, September 2016,2017,2018,2019,2020.

Presentation at the Bayesian Meeting (Workshop), Uppsala University, November 2016.

Presented my research at an internal seminar, Division of Systems and Control, Uppsala University, June 2016.

Presented my research at ACCESS Linnaeus Center Seminar Series, KTH, Stockholm, February 2016.

Presented my research at the Swedish Defence Research Agency, Stockholm, October 2015 .

Presented the conference papers [C2]–[C5], [C7], [C9]-[C12] at their respective conferences.

Presented my Licentiate thesis [Lic], March 2013, Linköping University.

Presented paper [C5] at Reglermöte, Uppsala, June 2012.

Presented my Master's thesis [MSc], November 2010, Radionavigeringsnämnden, Stockholm.

Presented my Master's thesis [MSc], October 2010, Luleå University of Technology, Division of Systems and Interaction.

Several internal presentations at Automatic Control, Linköping University as well as in Division of Systems and Control, Uppsala University.

Supervision

Current PhD students (as main supervisor)

2020 –   Philipp Pilar (previously at Vienna University of Technology, Austria)

2020 –   Carmen Lee (previously at Uppsala University, Sweden). Industrial, with Ericsson AB. (currently on approved leave from studies)

Current PhD students (as co-supervisor)

2021 –   Anna Frigge (previously at Heinrich-Heine-University, Düsseldorf, Germany)

2019 –   Daniel Gedon (previously at Delft University of Technology, The Netherlands)

Graduated PhD students

2017 - 2022	Carl Jidling, **Tailoring Gaussian processes and large-scale optimisation**, co-supervisor.
2016 - 2022	Carl Andersson, **Deep probabilistic models for sequential and hierarchical data**, co-supervisor.

Graduated licentiate students

2019	Carl Andersson, **Deep learning applied to system identification: A probabilistic perspective**, co-supervisor.
2019	Carl Jidling, **Tailoring Gaussian processes for tomographic reconstruction**, co-supervisor.

Graduated MSc Students (as subject reader/ supervisor)

2022	**Predicting purchase intentions of customers by using web data**, Olle Kåhre Zäll, performed at Bonava, Stockholm.
2021	**Creation of a Next-Generation Standardized Drug Grouping for QT Prolonging Reactions using Machine Learning Techniques**, Jacob Tiensuu and Elsa Rådahl, performed at Uppsala Monitoring Center.
2021	**Federated Neural Collaborative Filtering for privacy-preserving recommender systems**, Johannes Langelaar and Adam Strömme Mattsson, performed at SEB, Stockholm.
2021	**Using machine learning to predict power deviations at Forsmark**, Albin Björn, performed at Vattenfall, Forsmark.
2020	**Exploring NMF and LDA Topic Models of Swedish News Articles**, Karin Svenson and Johan Blad, performed at Bonnier News, Stockholm.
2020	**Learning stationary tasks using behavior trees and genetic algorithms**, Martin Edin, performed at ABB Robotics, Västerås.
2020	**Privacy-preserving proof-of-location using homomorphic encryption**, Carmen Lee, performed at RISE, Stockholm.
2020	**Fantastic bots and where to find them**, Agaton Svenaeus, performed at Uppsala University.
2020	**Building a Medical Recommendation System: A case study on digitalizing evidence-based radiology** Fabian Persson, performed at Collective minds radiology, Stockholm.
2019	**Network Anomaly Detection and Root Cause Analysis with Deep Generative Models**, Alexandros Patsanis, performed at Ericsson AB, Stockholm.
2019	**Classifying Material Defects with Convolutional Neural Networks and Image Processing**, Jawid Heidari, performed at Sandvik Coromant, Gimo.
2019	**Deinterleaving pulse trains with DBSCAN and FART**, Shad Mahmod, performed at Saab, Stockholm.
2019	**Drug Name Recognition in Reports on Concomitant Medication**, Arvid Gräns, performed at Uppsala Monitoring Centre.
2019	**Language Classification of Music Using Metadata**, Linus Roxbergh, performed at Spotify, Stockholm.
2019	**Maskininlärning inom kundanalys: Prediktion av kundbeteende inom energibranchen**, André Lerdell and Simon Shadman. Perfomed at Business Vision, Stockholm.
2018	**Maskininlärning inom kommersiella fastigheter: Prediktion av framtida hyresvakanser**, Fredrik Johnson and Brook Alemayehu. Perfomed at Business Vision, Stockholm.
2018	**Rigid barrier or not?: Machine Learning for classifying Traffic Control Plans using geographical data**, Cornelia Wallander. Perfomed at Helsingborgs stad.
2018	**Video Recommendation Based on Object Detection**, Selma Nyberg. Performed at Spotify.
2018	**Evaluation of Pretraining Methods for Deep Reinforcement Learning**, Emil Larsson. Perfomed at FOI, Stockholm.

2017	**Maskininlärning i fastighetsbranschen: Prediktion av felanmälningar gällande inomhusklimat baserat på sensordata**, Ellen Cecilie Schnackenburg and Karl Leife. Performed at Business Vision, Stockholm.
2017	**A deep learning approach for action classification in American football video sequences**, Jacob Westerberg. Performed at XO Wizard, Linköping.
2017	**Production planning of combined heat and power plants with regards to electricity price spikes - A machine learning approach**, Nathalie Fransson. Performed at Fortum.
2014	**GPU Implementation of the Particle Filter** Joakim Gebart. Inhouse project at Automatic Control, Linköping University.
2014	**Geolocation by Light using Target Tracking** Linus Envall. Inhouse project at Automatic Control, Linköping University.
2014	**Motion Tracking Using a Permanent Magnet** Jacob Antonsson. Performed at Biomedical Signals and Systems Group, Twente University.
2013	**Model Predictive Control for Active Magnetic Bearing** Joachim Lundh. Performed at ABB CRC Västerås.
2012	**Real-time Model Predictive Control of a Tricopter** Karl-Johan Barsk. Inhouse project at Automatic Control, Linköping University.
2012	**Evaluation of a new 5 DOF tracking device for user input** Lucas Correia and David Jonsson. Inhouse project at Visualization Centre C Norrköping, Linköping University.
2012	**Sensor Localization Calibration of Ground Sensor Networks with Acoustic Range Measurements** Viktor Deleskog. Performed at FOI, Linköping.

Reviewer Commitments

Opponent, Krista Longi, Department of Computer Science, University of Helsinki, Finland, 2022.

Pre-examiner, Çağatay Yıldız, Department of Computer Science, Aalto University, Finland, 2021.

Reviewer Technometrics, Automatica, ISIF Journal of Advances in Information Fusion, International Journal of Control, Digital Signal Processing, NIPS/NeurIPS 2015, 2017, ICML 2017-2019, IROS 2020, MLSP 2020, L4DC 2021-2022, FUSION

Pedagogical Education

2022	Assessment, grading and feedback (1 week)
2022	Supervisory course: Teaching and Assessing Academic Writing (2 days)
2021	Subject-based teaching and learning (2 weeks)
2020	Supervision of PhD students (3 weeks)
2011	Teaching in higher education, Step 1: Learning, instructing and knowledge (4 weeks)

Language Skills

Swedish	Mother tongue
English	Fluent
German	Fluent
Spanish	Basic

Computer Skills

- **Operating systems:** Windows, Linux
- **Office tools:** LaTeX, Ms Office
- **Computational tools:** MATLAB, R, Mathematica, Python
- **Version Control:** Git, SVN, CVS