

Curriculum Vitæ of Niklas Wahlström

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Name: Niklas Wahlström
Address: Lövestavägen 40A
SE-19442 UPPLANDS VÄSBY
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*
Supervisors: Prof. Fredrik Gustafsson and Prof. Thomas Schön
- 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 - **Member of the board** Master’s program in image analysis and machine learning, Uppsala University.
- 2017 - **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 concertmaster.

Publications

7 peer-reviewed journal papers, 18 peer-reviewed conference papers, Google Scholar h-index 14, citations: 581. All publications are available from <http://www.it.uu.se/katalog/nikwa778/publications>.

Theses

- [PHD] N. Wahlström. *Modeling of Magnetic Fields and Extended Object for Localization Applications*. Phd thesis, Linköping University, Automatic Control, December 2015.
- [LIC] N. Wahlström. *Localization using Magnetometers and Light Sensors*. Licentiate’s thesis, Linköping University, Automatic Control, March 2013.
- [MSC] N. Wahlström. Target tracking using Maxwell’s equations. Master’s thesis, Linköping University, Automatic Control, June 2010.

Journal Papers

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

- [J7] Z. Purisha, C. Jidling, N. Wahlström, T. Schön, and S. Särkkä. Probabilistic approach to limited-data computed tomography reconstruction. *Inverse Problems*, 2019.
- [J6] C. Jidling, J. Hendriks, N. Wahlström, A. Gregg, T. B. Schön, C. Wensrich, and A. 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] A. Solin, M. Kok, N. Wahlström, T. B. Schön, and S. Särkkä. Modeling and interpolation of the ambient magnetic field by Gaussian processes. *IEEE Transactions on Robotics*, 34(4):1112 – 1127, 2018.
- [J4] G. Hendeby, F. Gustafsson, N. Wahlström, and S. Gunnarsson. A Platform for Teaching Sensor Fusion Using a Smartphone. *International Journal of Engineering Education*, 33(2B):781–789, 2017.
- [J3] N. Wahlström and E. Özkan. Extended target tracking using Gaussian processes. *IEEE Transactions on Signal Processing*, 63(16):4165–4178, 2015.
- [J2] N. Wahlström, R. Hostettler, F. Gustafsson, and W. Birk. Classification of driving direction in traffic surveillance using magnetometers. *IEEE Transactions on Intelligent Transportation Systems*, 15(4):1405–1418, 2014.
- [J1] N. Wahlström and F. 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.

- [C18] C. Andersson, A.H. Ribeiro, K. Tiels, N. Wahlström, and T. B. Schön. Deep convolutional networks in system identification, 2019. Accepted to IEEE 58th Conference on Decision and Control (CDC).

- [C17] C. Andersson, N. Wahlström, and T. 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] C. Jidling, N. Wahlström, A. Wills, and T. 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] E. Özkan, N. Wahlström, and S. 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] F. Ceragioli, G. Lindmark, C. Veibäck, N. Wahlström, M. Lindfors, and C. Altafini. A bounded confidence model that preserves the signs of the opinion. In *European Control Conference*, Aalborg, Denmark, June 2016.
- [C13] J.-A. M. Assael, N. Wahlström, T. B. Schön, and M. 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] N. Wahlström, T. B. Schön, and M. P. Deisenroth. Learning deep dynamical models from image pixels. In *Proceedings of the 17th IFAC Symposium on System Identification (SYSID)*, Beijing, China, October 2015.
- [C11] N. Wahlström, T. B. Schön, and M. 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] N. Wahlström, P. Axelsson, and F. 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] G. Hendeby, F. Gustafsson, and N. 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] V. Deleskog, H. Habberstad, G. Hendeby, D. Lindgren, and N. Wahlström. Robust NLS sensor localization using MDS initialization. In *Proceedings of 17th International Conference on Information Fusion (FUSION)*, Madrid, Spain, July 2014.
- [C7] N. Wahlström, M. Kok, T. B. Schön, and F. 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] M. Kok, N. Wahlström, T. B. Schön, and F. 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] N. Wahlström, F. Gustafsson, and S. 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] N. Wahlström, R. Hostettler, F. Gustafsson, and W. 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] N. Wahlström, J. Callmer, and F. 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] N. Wahlström, J. Callmer, and F. Gustafsson. Magnetometers for tracking metallic targets. In *Proceedings of 13th International Conference on Information Fusion (FUSION)*, Edinburgh, Scotland, July 2010.
- [C1] E. Almqvist, D. Eriksson, A. Lundberg, E. Nilsson, N. Wahlström, E. Frisk, and M. 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] F. Gustafsson and N. Wahlström. Method and device for pose tracking using vector magnetometers, March 2019. Patent.

Reviewer Commitments

Act as reviewer for several international journals and conferences, currently averaging 10 reviews each year.

Teaching Experience

- 2019 Course responsible, examiner, lecturer and course developer, **Advanced probabilistic machine learning** (4-5th year, 1 occasion), Uppsala University
- 2019 Course responsible, examiner, lecturer and course developer, **Deep learning** (PhD course, 1 occasion), Uppsala University
- 2017-2020 Lecturer, teaching assistant and developer, **Statistical machine learning** (3-4th year, 3 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

Supervision

Current PhD students (as active co-supervisor)

- 2019 – Daniel Gedon (previously at Delft University of Technology, The Netherlands)
- 2017 – Carl Jidling (previously at Uppsala University, Sweden)
- 2016 – Carl Andersson (previously at Uppsala University, Sweden)

Graduated licentiate students

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

Graduated MSc Students (as subject reader/ supervisor)

- 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 Mahmud, 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. Performed at Business Vision, Stockholm.

- 2018 **Maskininlärning inom kommersiella fastigheter: Prediktion av framtida hyresvakanser.** Fredrik Johnson and Brook Alemayehu. Performed at Business Vision, Stockholm.
- 2018 **Rigid barrier or not?: Machine Learning for classifying Traffic Control Plans using geographical data.** Cornelia Wallander. Performed 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. Performed 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.

Presentations and Lectures

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

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

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

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

Four lectures in a PhD course in deep learning, Uppsala University, March-May 2019.

Two lectures about deep learning in the course Statistical Machine Learning, Uppsala University, March 2019, 2018, and 2017.

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 2017 as well as 2016.

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 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.

Pedagogical Education

2020 Supervision of PhD students (3 weeks), ongoing

2011 Teaching in higher education, Step 1: Learning, instructing and knowledge (6 hp)

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