

# Clas Veibäck

## Curriculum Vitae

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## Summary

I am a PhD student in the automatic control group at Linköping University. My research is focused on target tracking with knowledge in sensor fusion, signal processing, machine learning, control, image processing and software development. In particular my research has focused on modelling target behaviours and sensors. I have previous work experience in the aeronautical industry developing a control system for unmanned aerial vehicles and avionics for SAAB Gripen.

## Education

- 2013– **PhD Student**, *Division of Automatic Control, Linköping University*, Linköping, Sweden.  
Focus on target tracking with knowledge in sensor fusion, signal processing, machine learning, control, image processing and software development
- 2005–2010 **Engineering Physics Student**, *Uppsala University*, Uppsala, Sweden.  
Focus on automatic control, signal processing and computer science
- 2008–2009 **Exchange Student**, *National University of Singapore*, Singapore.  
Two semesters of exchange studies taking courses in statistics and computer science

## Degrees

- 2016 **Licentiate of Engineering**, *Division of Automatic Control, Linköping University*, Linköping, Sweden.  
Thesis title: *Tracking of Animals Using Airborne Cameras*
- 2010 **Master of Science in Engineering Physics**, *Uppsala University*, Uppsala, Sweden.  
Performed at Instrument Control Sweden, Linköping. Thesis title: *Automatic Control of Unmanned Aerial Vehicles*

## Working Experience

- 2013–2016 **Teaching Assistant**, LINKÖPING UNIVERSITY, Linköping.  
Teaching in the courses Automatic Control, Engineering Project, Industrial Control Systems, Modelling and Simulation and Digital Signal Processing. Supervision of Master's thesis projects.
- 2012–2013 **System Developer**, COMBITECH, Linköping.  
Worked as an IT consultant at SAAB AERONAUTICS developing safety critical software for Gripen. Tasks included model-based software development of recording functionality and qualification of a safety critical real-time operating system.

- 2010–2012 **System Developer**, INSTRUMENT CONTROL SWEDEN, Linköping.  
Mainly worked with implementation of algorithms for control, filters for sensor fusion and communication protocols in C/C++. Tasks included participation in design and verification of PCBs, hardware debugging of electronics, flight testing, product development and training and support for customers.
- 2005–2009 **Engineer**, VOLVO AERO CORPORATION, Trollhättan.  
Recurrent summer job. Tasks included software engineering and statistical analysis.

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## Publications

- Journal\* C. Veibäck, G. Hendeby, and F. Gustafsson. Uncertain timestamps in linear state estimation. *Submitted to IEEE Transactions on Aerospace and Electronic Systems*, Submitted 2017. ISSN 0018–9251
- Conference J. Olofsson, C. Veibäck, G. Hendeby, and T. A. Johansen. Outline of a system for integrated adaptive ice tracking and multi-agent path planning. In *2017 Workshop on Research, Education and Development of Unmanned Aerial Systems*, Linköping, Sweden, Oct. 2017
- Conference J. Olofsson, A. Lindahl Flåten, and C. Veibäck. Gaussian field current estimation from drift sea ice tracking with the labeled multi-bernoulli filter. In *2017 OCEANS 17 conference*, Anchorage, Alaska, USA, Sept. 2017
- Conference J. Olofsson, C. Veibäck, and G. Hendeby. Sea ice tracking with a spatially indexed labeled multi-bernoulli filter. In *2017 20th International Conference on Information Fusion*, pages 376–383, Xi'an, China, July 2017
- Thesis C. Veibäck. *Tracking of Animals Using Airborne Cameras*. Licentiate's thesis, Linköping University, Nov. 2016
- Journal G. Bianco, M. Ilieva, C. Veibäck, K. Öfjäll, A. Gadomska, G. Hendeby, M. Felsberg, F. Gustafsson, and S. Åkesson. Emlen-funnel experiments revisited: methods update for studying compass orientation in songbirds. *Ecology and Evolution*, 2016. ISSN 2045-7758
- Conference C. Veibäck, G. Hendeby, and F. Gustafsson. On fusion of sensor measurements and observation with uncertain timestamp for target tracking. In *2016 19th International Conference on Information Fusion*, pages 1268–1275, Heidelberg, Germany, July 2016
- Conference F. Ceragioli, G. Lindmark, C. Veibäck, N. Wahlström, M. Lindfors, and C. Altafini. A bounded confidence model that preserves the signs of the opinions. In *2016 European Control Conference*, Aalborg, Denmark, June 2016
- Conference S. Gunnarsson, Y. Jung, C. Veibäck, and T. Glad. IO (Implement and Operate) first - an alternative way to approach the automatic control subject. In *5:e Utvecklingskonferensen för Sveriges ingenjörsutbildningar*, Uppsala, Sweden, Feb. 2016

Conference C. Veibäck, G. Hendeby, and F. Gustafsson. Tracking of dolphins in a basin using a constrained motion model. In *2015 18th International Conference on Information Fusion*, pages 1330–1337, Washington, D.C., USA, July 2015

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## Presentations

- Presentation On Fusion of Sensor Measurements and Observation with Uncertain Timestamp for Target Tracking. *International Conference on Information Fusion*, Heidelberg, Germany, July 7, 2016.
- Presentation On Observations with Stochastic Timestamps. *Reglermöte*, Göteborg, Sweden, June 9, 2016.
- Presentation Tracking of Dolphins in a Basin Using a Constrained Motion Model. *International Conference on Information Fusion*, Washington, D.C., USA, July 2015.
- Poster Uncertain Timestamp Model. *LINK-SIC Workshop 2017*, Linköping, Sweden, November 6, 2017.
- Poster Sea Ice Tracking. *LINK-SIC Workshop 2017*, Linköping, Sweden, November 6, 2017.
- Presentation Animal Tracking for Behaviour Analysis. *CAnMove Workshop - Identifying Mutual Interests in Computer Vision and Animal Movement Research*, Lund, Sweden, November 8, 2016.
- Poster Uncertain Timestamp Model. *LINK-SIC Workshop 2016*, Linköping, Sweden, November 7, 2016.
- Presentation Tracking of Animals Using Airborne Cameras. *LINK-SIC Workshop 2016*, Linköping, Sweden, November 7, 2016.
- Poster Tracking of Animals using Imaging Sensors. *LINK-SIC Workshop 2015*, Leuven, Belgium, November 9, 2015.
- Poster Airborne Target Tracking Using Visual and IR Cameras. *LINK-SIC Workshop 2014*, Södertälje, Sweden, November 10, 2014.
- Poster Outline of a Multi-Agent Surveillance System. *TAMSEC 2017*, Kista, Sweden, November 28-29, 2017.
- Presentation Tracking of Animals Using Airborne Cameras. Licentiate's Seminar, Linköping, Sweden, November 25, 2016.
- Poster Airborne Sensor Platforms for Surveillance of Smart Savannahs. *TAMSEC 2015*, Kista, Sweden, November 24-25, 2015.
- Presentation Dolphin Tracking. Phd Student seminar, Linköping University, Sweden, May 28, 2015.

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## Reviewing Experience

Reviewer **Fusion**, 2016

Reviewer **Automatica**, 2017

## Courses

2013 Autumn	<b>Networked Control and Multi-Agent Systems</b>	3p
	<b>Nonlinear Control</b>	9p
	<b>Bayesian Learning</b>	6p
2014 Spring	<b>Nonlinear Optimization</b>	9p
	<b>System Identification</b>	12p
2014 Autumn	<b>Target Tracking</b>	9p
	<b>Dynamic Systems</b>	9p
2015 Spring	<b>Visual Object Recognition</b>	3p
	<b>Networked Dynamical Systems</b>	3p
	<b>Sensor Fusion</b>	9p
2015 Autumn	<b>Methodology of Science and Technology</b>	4p
	<b>Research Ethics</b>	2p
2016 Autumn	<b>Introduction to Machine Learning</b>	6p
	<b>IT and Cyber Security in Society</b>	3p
2017 Spring	<b>Teaching in Higher Education</b>	6p
	<b>Advanced Algorithmic Problem Solving</b>	9p
2017 Autumn	<b>Advanced Machine Learning</b>	6p
	<b>Matrix Analysis</b>	8p

## Teaching

2013 Fall	<b>Automatic Control</b>	TA & LA
	<b>Automatic Control</b>	TA, CA & LA
	<b>Engineering Project</b>	PS
	<b>Modeling and Simulation</b>	LA
2014 Spring	<b>Industrial Control Systems</b>	TA, CA & LA
	<b>Industrial Control Systems</b>	TA, CA & LA
	<b>Automatic Control</b>	LA
2014 Fall	<b>Automatic Control</b>	LA
	<b>Modeling and Simulation</b>	LA
	<b>Automatic Control</b>	LA
	<b>Digital Signal Processing</b>	TA & LA
	<b>Engineering Project</b>	PS
	<b>Engineering Project</b>	PS
2015 Spring	<b>Industrial Control Systems</b>	LA
	<b>Automatic Control</b>	LA
2015 Fall	<b>Modeling and Simulation</b>	LA
	<b>Digital Signal Processing</b>	TA, CA & LA
	<b>Engineering Project</b>	PS

Teaching Assistant	Teaching at lessons and problem solving sessions
Course Assistant	Administrative support to examiner, such as proofreading exam, updating homepage and scheduling
Lab Assistant	Teaching at lab sessions
Project Supervisor	Supervising student projects

## Supervision

- Thesis J. Tjerngren. Modeling and hardware-in-the-loop simulations of contactor dynamics: Mechanics, electromagnetics and software. Master's thesis, Linköping University, 2014
- Thesis M. Pettersson. Extended kalman filter for robust UAV attitude estimation. Master's thesis, Linköping University, 2015
- Thesis T. Johnsson. Autonomous following and filming of a test vehicle. Master's thesis, Linköping University, 2016
- Thesis C. Christensson and A. Flodell. Wildlife surveillance using a UAV and thermal imagery. Master's thesis, Linköping University, 2016
- Thesis J. Stenström. Simultaneous trajectory optimization and target estimation using RSS measurements to land a UAV. Master's thesis, Linköping University, 2016
- Thesis J. Hyllengren. Clustering for multi-target tracking. Master's thesis, Linköping University, 2017

## Languages

Swedish	Native Proficiency
English	Full Working Proficiency
Spanish	Basic Phrases

## Grants

- 2009 **Scholarship**, *Lennart Halls stiftelse*. Awarded for ambitious studies
- 2008 **Scholarship**, *Gull and Stellan Ljungbergs stiftelse*. Awarded for ambitious studies in support of studies abroad

## References

References are available on request.