Robert Mattila

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Research Interests

- Identification, control and inference in stochastic dynamical systems
- Hidden Markov models and (partially observed) Markov decision processes
- Machine learning and optimization

Education

- **KTH Royal Institute of Technology** — Stockholm, Sweden
  PhD, Department of Automatic Control — *2015 - 2020 (Projected)*
    - Supervisors: Prof. Bo Wahlberg and Assoc. Prof Cristian R. Rojas.
    - Topic: Identification and control of hidden Markov models.

- **KTH Royal Institute of Technology** — Stockholm, Sweden
  B.Sc. Engineering Physics, M.Sc. Systems, Control and Robotics — *2010 - 2015*
    - The Swedish degree of *Civilingenjör i Teknisk Fysik*.
    - The graduation date was one semester earlier than nominal time.
    - B.Sc. GPA of 4.98/5.0 and M.Sc. GPA of 5.0/5.0 .

- **UCM, Universidad Cumplutense de Madrid** — Madrid, Spain
  ERASMUS Exchange studies — *Spring 2013*
    - All (five) courses taken were taught in Spanish (including reading material).
    - GPA of 8.13/10.0 .

- **THG, Thorildsplans gymnasium** — Stockholm, Sweden
  Natural Sciences with specialization on Mathemathics and Computer Science — *2007 - 2010*

Skills, Merits and Awards

- **Computer Skills:**

Programming:	Matlab, Python, Julia, Java
Operating Systems:	OSX, Linux, Windows
Other:	LaTeX, git

- **Languages:** Native in Swedish, fluent in English and proficient (B2) in Spanish

- **Awards:**

    - Awarded the KTH Electrical Engineering Scholarship of Excellence (1 MSEK) in 2015.
    - Awarded a SURF scholarship from Caltech to work with Prof. Richard Murray in 2014.

- – Awarded the Henrik Göransson's Sandviken Scholarship and the KTH Student Scholarship (twice) for outstanding grades.
  - – Participated in *Wallenbergs Fysikpris 2010* (Swedish qualifications for the International Physics Olympiad). Reached the final with the best result amongst all participants from Stockholm (in the qualification round) and placed 7th in the final.
  - – Awarded scholarship for outstanding grades when graduating from THG.

- **Reviewer** for the IEEE *Conference on Decision and Control* (CDC), the IFAC *American Control Conference* (ACC) and the IFAC *Automatica* journal.

- **KIBok** (`www.kibok.se`): Have founded and developed a marketplace for used textbooks for students of Karolinska Institutet. The environment used is Python with Django.

- Hold a Swedish driver's license (B).

Publications

Journals

- Robert Mattila, Cristian. R. Rojas, Vikram. Krishnamurthy, and Bo Wahlberg, *Asymptotically Efficient Identification of Known-Sensor Hidden Markov Models.* IEEE Signal Processing Letters, 2017, 24.12: 1813-1817.

Conferences

- Robert Mattila, Cristian R. Rojas, Vikram Krishnamurthy and Bo Wahlberg, *Inverse Filtering for Hidden Markov Models.* In the 31st Annual Conference on Neural Information Processing Systems (NIPS'17), Long Beach, USA, 2017.

- Robert Mattila, Cristian R. Rojas, Vikram Krishnamurthy and Bo Wahlberg, *Identification of Hidden Markov Models Using Spectral Learning with Likelihood Maximization.* In the 56th IEEE Conference on Decision and Control (CDC'17), Melbourne, Australia, 2017.

- Antti Siika, Robert Mattila, Bo Wahlberg and Joy Roy. *An Optimal Gender-Specific Treatment Policy for Abdominal Aortic Aneurysms Constructed Using a Markov Decision Process Model.* In the Society for Vascular Surgery's Vascular Annual Meeting (VAM'17), San Diego, USA, 2017.

- Robert Mattila, Cristian R. Rojas, Vikram Krishnamurthy, Bo Wahlberg, *Computing monotone policies for Markov decision processes: a nearly-isotonic penalty approach.* In the 20th IFAC World Congress, Toulouse, France, 2017.

- Robert Mattila, Antti Siika, Joy Roy and Bo Wahlberg, *A Markov Decision Process Model to Guide Treatment of Abdominal Aortic Aneurysms.* In the IEEE Conference on Control Applications (CCA'16), Buenos Aires, Argentina, 2016.

- Robert Mattila, Vikram Krishnamurthy and Bo Wahlberg, *Recursive Identification of Chain Dynamics in Hidden Markov Models Using Non-Negative Matrix Factorization.* In 54th IEEE Conference on Decision and Control (CDC'15), Osaka, Japan, 2015.

- Robert Mattila, Yilin Mo and Richard M. Murray, *An Iterative Abstraction Algorithm for Reactive Correct-by-Construction Controller Synthesis.* In 54th IEEE Conference on Decision and Control (CDC'15), Osaka, Japan, 2015.

- Robert Mattila, Cristian R. Rojas and Bo Wahlberg, *Evaluation of Spectral Learning for the Identification of Hidden Markov Models.* In 17th IFAC Symposium on System Identification (SYSID'15), Beijing, China, 2015.

Other

- Robert Mattila, Cristian R. Rojas, Vikram Krishnamurthy and Bo Wahlberg, *Inverse Filtering for Hidden Markov Models.* Poster at the 2017 Workshop of the European Research Network on System Identification (ERNSI), September, Lyon, France.

- Robert Mattila, Cristian R. Rojas, Vikram Krishnamurthy and Bo Wahlberg, *Method of Moments Identification of Hidden Markov Models with Known Sensor Uncertainty Using Convex Optimization.* Poster at the 2016 Workshop of the European Research Network on System Identification (ERNSI), September, Cison di Valmarino, Italy.

- Robert Mattila, Cristian R. Rojas, Vikram Krishnamurthy and Bo Wahlberg, *Method of Moments Identification of Hidden Markov Models with Known Sensor Uncertainty Using Convex Optimization.* Poster at Reglermötet 2016, June, Göteborg, Sweden.

- Robert Mattila, Vikram Krishnamurthy and Bo Wahlberg, *Recursive Method of Moments Identification of Hidden Markov Models using Convex Optimization.* Poster at the 2015 Workshop of the European Research Network on System Identification (ERNSI), September, Varberg, Sweden.

- Robert Mattila, *On Identification of Hidden Markov Models Using Spectral and Non-Negative Matrix Factorization Methods.* Master's thesis, KTH Royal Institute of Technology. Stockholm, Sweden, 2015. Supervisors: Prof. Bo Wahlberg and Assoc. Prof. Cristian R. Rojas.

- Robert Mattila, *Including Bathymetric Data in Autonomous Surface Vessels' Maneuvering Optimisation Tool.* Bachelor's thesis, KTH Royal Institute of Technology. Stockholm, Sweden, 2015. Supervisors: Prof. Juan Jiménez and José María Benítez.

Academic Experience

- **Cornell Tech, Cornell University** Manhattan, USA
  Invited researcher by Prof. Vikram Krishnamurthy Summer 2017
- **VUB-ELEC, Workshop on System Identification** Brussels, Belgium
  Included courses on Summer 2017
  - Frequency response function measurements (non-parametric tools), dynamic system identification (parametric tools) and control-oriented system identification by, among others, John Lataire, Yves Rolain, Rik Pintelon, Ivan Markovsky, Philippe Dreesen and Simone Formentin.
- **S^{3}CS, Swedish Summer School in Computer Science** Djurö, Sweden
  The courses were taught by Summer 2016
  - Michael Mitzenmacher (Hashing Algorithms);
  - Sergei Vassilvitskii (Algorithms for Modern Parallel Systems).
- **UBC, University of British Columbia** Vancouver, Canada
  Invited researcher by Prof. Vikram Krishnamurthy Summer 2015
- **UBC, University of British Columbia** Vancouver, Canada
  Master thesis with Prof. Vikram Krishnamurthy Autumn 2014

- **Caltech, California Institute of Technology**   Pasadena, USA
  SURF in the Control and Dynamical Systems (CDS) group   *Summer 2014*
    - Supervisors: Prof. Richard M. Murray and Asst. Prof. Yilin Mo
    - Developed an improved abstraction algorithm for the correct-by-construction controller synthesis framework `TuLiP` (implemented in Python).

- **KTH, Royal Institute of Technology**   Stockholm, Sweden
  Research intern for Prof. Bo Wahlberg   *Summer 2013*

- **ZJU, Zhejiang University**   Hangzhou, China
  Participated in the Joint Research Center of Photonics Workshop   *Summer, 2012*
    - Implemented optical logic gates exploiting non-linearities in fibers.

Industry Experience

- **Stockholm Vatten AB**   Stockholm, Sweden
  Summer intern   *Summer 2011 and 2012*
    - Warehouse work including collecting and delivering items; cleaning and repairing machines; contacting customers; administrative work in the supply system Agresso.

Teaching

- **EL2800 Stochastic Control and Optimization**   KTH
  Teaching assistant   *Autumn 2017*

- **Master Thesis**   KTH
  Supervisor for Daniel Merkoulova   *Spring 2017*

- **EL1000 Automatic Control**   KTH
  Teaching assistant   *Autumn 2016*

- **EH1010 Project Course in Electrical Engineering**   KTH
  Supervisor   *Spring 2016*

- **EL1000 Automatic Control**   KTH
  Teaching assistant   *Autumn 2015*

PhD Courses

- Partially observed Markov decision processes
- Game theory
- Mathematical methods in signals, systems and control
- Bayesian networks
- Hybrid systems (stability, stabilization, abstraction and formal verification)
- Probabilistic verification and synthesis
- Matrix algebra
- Probability and random processes
- Convex optimization
- Stochastic control and optimization
- Deep learning in data science (attended lectures)