

# EMMA TEGLING

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KTH EECS  
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Née Sjödin  
Nationality: Swedish  
Date of birth: 1988-09-04

I received my Ph.D. degree from the Department of Automatic Control at KTH in January 2019. My research interests are within analysis and control of large-scale networked systems, and electric power networks in particular. My main contributions demonstrate certain fundamental limitations to the performance of distributed control algorithms and describe their implications for the envisioned smart power grid. I have spent time as a visiting researcher at UCSB, Johns Hopkins University and Caltech, and have previous experience from consulting.

## Education and research

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**KTH Royal Institute of Technology, Stockholm, Sweden** **2009 – 2013, 2014 – present**

**Postdoctoral researcher.**

Division of Decision and Control Systems

### Degrees:

**Ph.D. Electrical Engineering, 2019**

Thesis advisor: Prof. Henrik Sandberg, Co-advisor: Prof. Karl H. Johansson

**Tekn. Lic. (*Licentiate degree*) Electrical Engineering, 2016**

**M.Sc. Engineering physics, 2013**

**B.Sc. Engineering physics, 2011**

**UC Santa Barbara, Santa Barbara, CA** **2015**

**Research visit, April - July**

Advisor: Prof. Bassam Bamieh

**Johns Hopkins University, Baltimore, MD** **2013**

**Research assistantship (M.Sc. thesis project), March - July**

Advisor: Prof. Dennice F. Gayme

**California Institute of Technology, Pasadena, CA** **2011**

**Research internship (SURF), June - August**

Advisors: Prof. Steven Low, Dennice F. Gayme

**Berlin Institute of Technology, Berlin, Germany** **2008 – 2009**

**Exchange studies, Engineering Science**

## Industry experience

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**Ericsson Strategic Programs Practice, Stockholm, Sweden** **2013 – 2014**

**Business analyst**

- Corporate strategy: worked in a team to develop medium- to long-term strategy for business verticals, including smart grid and transportation segments
- Sales reinforcement: led implementation of renewed incentives for global sales force

**Scandinavian Risk Solutions, Stockholm, Sweden** **2009 – 2013**

**Consultant, part-time**

- Performed analyses for information security and business intelligence projects

**ABB FACTS (Flexible AC Transmission Systems), Västerås, Sweden** **2012**

**Intern, June - August**

- Developed dimensioning tool for grid-scale battery-based energy storage system
- Performed market survey for energy storage systems in Sweden

**Participant in leadership and mentoring program**

- Competitive program that gives first-hand insights to one of the world leaders in power and automation, as well as leadership training, networking and mentorship opportunities.

**Teaching and supervision**

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**B.Sc. Level: Automatic Control, basic course. 2015, 2016, 2017, 2018**

- Held exercise classes and laboratory exercises. Helped in constructing and grading exams.

**M.Sc. Level: Automatic Control, project course (supervision of 3-5 students). 2015, 2016**

- Projects: Scheduling of grid-scale energy storage (2015), Control of a solar gas turbine (2016)

**Supervision:**

- Hendrik Flamme (M.Sc. student). Project: Limitations of distributed integral control in power networks. Now at RWTH Aachen. 2017.
- Christian Barbieri (M.Sc. student). Project: Scalable integral control in networks. 2019.

**Awards**

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- Xylem award for best master's thesis in electrical, mechanical or industrial engineering, KTH, 2013
- Henrik Göransson's stipend for excellent study results, KTH, 2012
- Travel awards: Wallenberg foundation 2017, Lindstrand foundation 2017

**Invited seminars**

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*I have been invited to give hour-long seminars on my research at the following universities:*

- **CNRS Grenoble**, Gipsa-lab, Grenoble, France. *March 2019.*
- **Johns Hopkins University**, Laboratory for Computational Sensing and Robotics (LCSR) seminar, Baltimore, MD, *March 2019.*
- **MIT**, Laboratory for Information and Decision Systems (LIDS), Boston, MA, *March 2019.*
- **Hong Kong University**, Dept. of Electrical and Electronic Engineering, Hong Kong. *July 2018.*
- **Lund University**, Dept. of Automatic Control, Lund, Sweden. *March 2018.*
- **University of Melbourne**, Dept. of Electrical and Electronic Engineering, Melbourne, VIC, Australia. *December 2017.*
- **UC Berkeley**, Electrical Engineering and Computer Science, Berkeley, CA. *April 2017.*
- **UC Santa Barbara**, CCDC (Center for Control, Dynamical Systems and Computation) seminar, Santa Barbara, CA. *April 2017.*
- **University of Southern California**, Center for Systems and Control, Los Angeles, CA. *April 2017.*
- **Tufts University**, Dept. of Electrical and Computer Engineering, Medford, MA. *June 2016.*

**Workshops, courses and outreach**

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- Outreach: Curating KTH official Instagram account @kthuniversity. *March 2019 (upcoming).*
- Research program: Isaac Newton Institute: The mathematics of energy systems, Cambridge, UK. Invited participant, Cambridge Philosophical Society bursary nominee. *January 2019.*
- Conference: 23<sup>rd</sup> International Symposium on Mathematical Theory of Networks and Systems, Hong Kong. Presentation: "Noise-induced limitations to the scalability of distributed integral control." *July 2018.*
- Conference: Swedish Control Conference, Stockholm, Sweden. Presentation: "On the Coherence of Large-Scale Networks with Distributed PI and PD Control." *June 2018.*
- Outreach: Forskar Grand Prix, Stockholm, Sweden. Competition in popular scientific presentation of own research for high school students. Won 2<sup>nd</sup> place for presentation "Large-scale collaboration in networks." *September 2017.*
- Workshop: Banff International Research Station (BIRS): Women in Control: New Trends in Infinite Dimensions, Banff, AB, Canada. Poster presentation. *July 2017.*

- Workshop: Grid Science winter school and conference, by Los Alamos National Laboratory, Santa Fe, NM. Poster presentation. *January 2017*.
- Course: EECI graduate school for control: *Distributed Computation and Control* by S. Morse, St Petersburg, Russia. *May 2016*.

## Service

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### Technical reviewer

- *Journals*: IEEE Transactions on Automatic Control, IEEE Transactions on Control of Network Systems, IEEE Control Systems Letters, IEEE Transactions on Power Systems, Automatica, Systems & Control Letters.  
*Certificate of outstanding service as a Reviewer of the IEEE Control Systems Letters, 2018*
- *Conferences*: IEEE Conference on Decision and Control, American Control Conference, European Control Conference, IFAC Workshop on Distributed Estimation and Control in Networked Systems (NecSys), IEEE Conference on Control Technology and Applications.

### Conference session chair or co-chair

- IEEE Conference on Decision and Control, American Control Conference, International Symposium on Mathematical Theory of Networks and Systems.

## Publications

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### Theses

1. **E. Tegling**: Fundamental limitations of distributed feedback control in large-scale networks, KTH, Dept. of Automatic Control, Stockholm, December 2018
2. **E. Tegling**: On performance limitations of large-scale networks with distributed feedback control, Licentiate thesis, KTH, Dept. of Automatic Control, Stockholm, May 2016
3. **E. Sjödin**: The price of synchrony: Evaluating transient power losses in renewable energy integrated power networks, M.Sc. Thesis KTH, Dept. of Automatic Control, Stockholm, August 2013, *Awarded best M.Sc. thesis in Electrical, Mechanical or Industrial Engineering at KTH*.
4. **E. Sjödin** and T. Lycken: Wear measurement in knee implants using computed tomography, B.Sc. Thesis, KTH, Dept. of Medical Imaging, Stockholm, June 2011

### Journal articles

1. **E. Tegling** and H. Sandberg: Noise-Induced Limitations to the Scalability of Distributed Integral Control. *Systems & Control Letters*, August 2018 (*conditionally accepted*)
2. **E. Tegling**, P. Mitra, H. Sandberg and B. Bamieh: On fundamental limitations of dynamic feedback control in large-scale networks. *IEEE Transactions on Automatic Control*, 2019 (*to appear*)
3. **E. Tegling**, and H. Sandberg: On the Coherence of Large-Scale Networks with Distributed PI and PD Control. *IEEE Control Systems Letters*, Vol. 1, No. 1, pp.170-175, June 2017.
4. **E. Tegling**, B. Bamieh and D. F. Gayme: "The Price of Synchrony: Evaluating the Resistive Losses in Synchronizing Power Networks", *IEEE Transactions on Control of Network Systems*, Vol. 2, No. 3, pp.254-266, September 2015

### Conference proceedings (peer reviewed)

1. **E. Tegling**, B. Bamieh and H. Sandberg: Localized high-order consensus destabilizes large-scale networks. *2019 American Control Conference (ACC)*, (*accepted*).
2. H. Flamme, **E. Tegling**, and H. Sandberg: Performance Limitations of Distributed Integral Control in Power Networks Under Noisy Measurements. *2018 American Control Conference (ACC)*, Milwaukee, WI, June 2018.
3. M. Andreasson, **E. Tegling**, H. Sandberg and K. H. Johansson: Coherence in Synchronizing Power Networks with Distributed Integral Control. *56th IEEE Conference on Decision and Control*, Melbourne, VIC, December 2017.

4. M. Andreasson, **E. Tegling**, H. Sandberg and K. H. Johansson: Performance and scalability of voltage controllers in multi-terminal HVDC networks. *2017 American Control Conference (ACC)*, Seattle, WA, May 2017
5. N. Govindarajan, H. Arbabi, L. van Blargian, T. Matchen, **E. Tegling** and I. Mezić: An operator-theoretic viewpoint to non-smooth dynamical systems: Koopman analysis of a hybrid pendulum. *55th IEEE Conference on Decision and Control*, Las Vegas, NV, December 2016
6. **E. Tegling**, M. Andreasson, J. W. Simpson-Porco and H. Sandberg: Improving performance of droop-controlled microgrids through distributed PI-control. *2016 American Control Conference (ACC)*, Boston, MA, July 2016. *Best presentation in session award.*
7. **E. Tegling**, D. F. Gayme and H. Sandberg: Performance metrics for droop-controlled microgrids with variable voltage dynamics. *54th IEEE Conference on Decision and Control*, Osaka, Japan, December 2015
8. **E. Sjödin** and D. F. Gayme: Transient losses in synchronizing renewable energy integrated power networks. *2014 American Control Conference (ACC)*, Portland, OR, June 2014
9. **E. Sjödin**, D. F. Gayme and U. Topcu: Risk mitigated optimal power flow for wind powered grids. *2012 American Control Conference (ACC)*, Montréal, Canada, June 2012

*I have presented all conference articles except #5 at the corresponding conference.*

## Other skills and competences

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### Languages

- Swedish (native)
- English (fluent)
- German (fluent)
- French (conversational)

### IT and programming

- Matlab, Simulink
- Fortran, Python
- MS Excel, QlikView

### Leadership, positions of trust

- Founder and organizer for KTH EE Female Ph.D. Student Network (2015–2017)
- Leadership training at ABB (2012), Ericsson (2014)
- Member of master's program council, KTH (2011–2012)

### Academic courses attended

- Practical philosophy, Stockholm University, 1 semester (2014–2015)
- Political Science, Stockholm University, ½ semester (2011)
- German, Stockholm University, 1 semester (2008–2009)

## References

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*Personal references, as well as copies of transcripts and certificates are available upon request.*