

EMMA TEGLING

tegling@mit.edu

www.tegling.se

Institute for Data, Systems, and Society
Massachusetts Institute of Technology
77 Massachusetts Avenue
Cambridge, MA 02139

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

I am a Postdoctoral Research Fellow at the Institute for Data, Systems, and Society (IDSS) at MIT. 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

Massachusetts Institute of Technology, Cambridge, MA
Institute for Data, Systems, and Society (IDSS)

2019 – present

Postdoctoral Research Fellow

Host: Prof. Ali Jadbabaie, Co-host: Prof. Munther Dahleh

KTH Royal Institute of Technology, Stockholm, Sweden
Division of Decision and Control Systems, KTH EECS

2009 – 2013, 2014 – 2019

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

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

ABB Sustainable Talent Program, Sweden

2012

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 and networking and mentorship opportunities.

Teaching and supervision

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

- Held exercise classes and laboratory exercises. Assisted 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 Ph.D. student at RWTH Aachen. 2017.
- Christian Barbieri (M.Sc. student). Project: Scalable integral control in networks. 2019.

Awards and Fellowships

- *Swedish Research Council* International Postdoc Grant, 2019
- *Foundation Blanceflor Boncompagni Ludovisi, née Bildt* stipend, 2019
- *Sweden-America Foundation* postdoctoral fellowship, 2019
- *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

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

- **University of Newcastle**, School of Electrical Engineering and Computing, Newcastle, NSW, Australia. *May 2019.*
- **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), Cambridge, 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

- Outreach: Curating KTH official Instagram account @kthuniversity. *March 2019.*
- Research program: Isaac Newton Institute: The mathematics of energy systems, Cambridge, UK. Invited participant, Cambridge Philosophical Society bursary nominee. *January 2019.*
- Conference: 23rd 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 2nd 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: EECS graduate school for control: *Distributed Computation and Control* by S. Morse, St Petersburg, Russia. *May 2016.*

Service

Technical reviewer

- *Journals:* IEEE Transactions on Automatic Control, IEEE Transactions on Control of Network Systems, IEEE Control Systems Letters, IEEE Transactions on Power Systems, IEEE Transactions on Smart Grids, Automatica, Systems & Control Letters, Chaos, IET Control Theory and Applications.
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, IFAC Symposium on Nonlinear Control Systems (NOLCOS).

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

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*, Vol 130, pp. 23-31, August 2019.

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**, R. H. Middleton and M. Seron: Scalability and Fragility in Bounded-Degree Consensus Networks. *8th IFAC Workshop on Distributed Estimation and Control in Networked Systems*, 2019 (*accepted*).
2. **E. Tegling**, B. Bamieh and H. Sandberg: Localized high-order consensus destabilizes large-scale networks. *2019 American Control Conference (ACC)*, Philadelphia, PA, July 2019.
3. 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.
4. 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.
5. 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
6. 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
7. **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*.
8. **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
9. **E. Sjödin** and D. F. Gayme: Transient losses in synchronizing renewable energy integrated power networks. *2014 American Control Conference (ACC)*, Portland, OR, June 2014
10. **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

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

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