

## News

### ELLIIT publication in Nature.

Working at the Department of Automatic Control in Lund, and supported by ELLIIT via professor Bo Bernhardsson, the supervisor of Jacob Bergstedt, the PhD student Jacob Bergstedt has worked with modeling and statistical analysis of the human immune system. The project has been a cooperation with the Pasteur Institute in Paris that needed help with statistical analysis of huge data sets recently made available in the so called Milieu Interieur project, see

<http://www.milieuinterieur.fr/en/project/project-overview> . The resulting paper, entitled "Natural variation in the parameters of innate immune cells is preferentially driven by genetic factors " has been published in Nature Immunology, see <https://www.nature.com/articles/s41590-018-0049-7> , and has also been given some attention in popular media, for instance in Vetenskapsradion at Sveriges Radio. For a popularized description in Swedish see <https://www.lu.se/article/detta-paverkar-vart-immunforsvar-allra-mest> .

### WASP initiative on AI

The Knut and Alice Wallenberg Foundation has granted an additional billion Swedish kronor to extend the Wallenberg Autonomous Systems and Software Program (WASP), with a broad investment into artificial intelligence. As a result of this the name of WASP will change to the Wallenberg Artificial Intelligence, Autonomous Systems and Software Program (WASP)

The initiative in artificial intelligence will follow two pathways. The larger of these involves an investment into machine learning, deep learning and the explainable AI. The second pathway deals with increasing our understanding of the mathematical principles behind AI.

Each of the two branches has resources to recruit 14 tenure-track assistant professors and 40 PhD students, where the research students will become members of graduate schools and take specialist courses in relevant fields. The two new graduate schools will coordinate with the graduate school that has already been established within the framework of WASP, where just over 100 research students are currently studying. Both the senior researchers and the research students will be recruited at the universities that are participating in WASP, primarily Chalmers University of Technology, the Royal Institute of Technology, Linköping University, Lund University and Umeå University. Further Swedish universities, however, may also benefit from the research grant.

Professor Danica Kragic from the Royal Institute of Technology will lead the AI part of the programme, and Professor Johan Håstad, also from the Royal Institute of Technology, the AI/mathematics part. Professor Karl-Erik Årzén, Lund University will lead the Autonomous Systems and Software part, i.e., the original WASP, and Professor Lars Nielsen from Linköping University will be the program director for all the three parts of WASP.

### SSF's Cybersecurity Call

ELLIIT researchers were successful in SSF's call for cybersecurity projects. Out of the 10 granted applications two were led by Lund researchers. Professor Christian Gehrman from EI/Lund University and SICS received 30 MSEK for the project "Cyber Security for Next Generation Factory"

and Martin Hell, also from EIT, received 22 MSEK for the project “Secure Software Update Deployment for the Smart City”. In addition to this Professor Thomas Johansson (EIT/LU) and Professor Erik G Larsson (ISY(LiU)) are co-applicants in the project “Secure and Private Connectivity in Smart Environments” led by Professor Panagiotis Papadimitratos at KTH that received 33 MSEK.

### **Nordic Industrial Hub on Industrial IoT**

Karl-Erik Årzén (AC/LU), Flavius Gruian (CS/LU), and Erik Larsson (EIT/LU) represent Lund in the new Nordforsk Nordic Hub on Industrial Internet of Things (IIoT). The total approved budget is 18 MNOK over three years. The additional partners are DTU, KTH, Aalto University, and NTNU. The coordinator is Paul Pop at DTU.

### **Joint User Activity and Non-Coherent Data Detection in mMTC-Enabled Massive MIMO Using Machine Learning Algorithms**

Machine-type communication (MTC) services are expected to be an integral part of the future cellular systems. A key challenge of MTC, especially for the massive MTC (mMTC), is the detection of active devices among a large number of devices. The sparse characteristics of mMTC makes compressed sensing (CS) approaches a promising solution to the device detection problem. CS-based techniques are shown to outperform conventional device detection approaches. However, utilizing CS-based approaches for device detection along with channel estimation and using the acquired estimates for coherent data transmission may not be the optimal approach especially for the cases where the goal is to convey only a few bits of data. In this work, we propose a non-coherent transmission technique for the mMTC uplink and compare its performance with coherent transmission. Furthermore, we demonstrate that it is possible to obtain more accurate channel state information by combining the conventional estimators with CS-based techniques. Further details: [K. Senel and E. G. Larsson, ITG Workshop on Smart Antennas, 2018]

### **Massive MIMO Has Unlimited Capacity**

Cellular communications with large-antenna arrays at the base stations and spatial multiplexing of many users per cell is known as Massive MIMO. Since its inception, the pilot contamination, caused by the necessary reuse of pilot sequences for channel estimation in multiple cells, has been viewed as a fundamental limitation for Massive MIMO. In particular, pilot contamination has been believed to create a finite channel capacity limit, as the number of antennas goes to infinity. In this paper, we prove that this is incorrect and an artifact from using simplistic channel models and suboptimal precoding/combining schemes when evaluating the performance. We show that with a certain type of precoding/combining and a tiny amount of spatial channel correlation or large-scale fading variations over the array, the capacity increases without bound as the number of antennas increases, even in the presence of pilot contamination. This new result contradicts previous “wisdom” and shows that there are no limits to how spectrally efficient the network can become. For example, consider a network with any finite number of UEs that each have a finite-valued data rate requirement. The main result implies that we can always satisfy these requirements by deploying sufficiently many antennas. Further details: Emil Björnson, Jakob Hoydis, Luca Sanguinetti, IEEE Transactions on Wireless Communications, vol. 17, no. 1, pp. 574-590, Jan. 2018.

## LiU/ISY/Communication systems launches YouTube channel

See this link <https://www.youtube.com/channel/UCOrjRoYJPqGiR1SZvU3xcYQ>

## Cross disciplinary program on Working and Organizing in the Digital age

Elizabeth Bjarnason participated in a cross disciplinary program on Working and Organizing in the Digital age, at the Lund University Pufendorf institute 2016/17. The final report was released Jan 29, 2018: Working and Organizing in the Digital Age, Stephan Schaefer, Magnus Andersson, Elizabeth Bjarnason, Kristofer Hansson (editors), The Pufendorf Institute for Advanced Studies, Lund University, Sweden, ISBN 9789198439410

## Synergies open innovation project

The VR funded ICT framework program Synergies on open innovation concluded by the end of 2017. Significant progress is made in understanding how open software can provide business value. Selected results in highly ranked journals:

- Hussan Munir, Per Runeson, and Krzysztof Wnuk. A theory of openness for software engineering tools in software organizations. Information and Software Technology, 2017. <https://doi.org/10.1016/j.infsof.2017.12.008>
- Hussan Munir, Johan Linåker, Krzysztof Wnuk, Per Runeson, and Björn Regnell. Open innovation using open source tools: a case study at Sony Mobile. Empirical Software Engineering, 23(1):186–223, 2018.
- Johan Linåker, Hussan Munir, Krzysztof Wnuk, and Carl-Eric Mols. Motivating the contributions: An open innovation perspective on what to share as open source software. Journal of Systems and Software, 135:17–36, 2018.

## Some Publications

- Ming Xiao, Shahid Mumtaz, Yongming Huang, Linglong Dai, Yonghui Li, Michail Matthaiou, George K. Karagiannidis, Emil Björnson, Kai Yang, Chih-Lin I, Amitabha Ghosh, “Millimeter Wave Communications for Future Mobile Networks,” IEEE Journal on Selected Areas in Communications, vol. 35, no. 9, pp. 1909-1935, September 2017.
- Emil Björnson, Jakob Hoydis, Luca Sanguinetti, “Massive MIMO Has Unlimited Capacity,” IEEE Transactions on Wireless Communications, vol. 17, no. 1, pp. 574-590, Jan. 2018.
- Hei Victor Cheng, Emil Björnson, Erik G. Larsson, “Performance Analysis of NOMA in Training Based Multiuser MIMO Systems,” IEEE Transactions on Wireless Communications, vol. 17, no. 1, pp. 372-385, Jan. 2018.
- Tan Tai Do, Emil Björnson, Erik G. Larsson, “Jamming-Resistant Receivers for the Massive MIMO Uplink,” IEEE Transactions on Information Forensics & Security, vol. 13, no. 1, pp. 210-223, Jan. 2018.
- Elisabeth de Carvalho, Emil Björnson, Jesper H. Sørensen, Erik G. Larsson, Petar Popovski, “Random Pilot and Data Access in Massive MIMO for Machine-type Communications,” IEEE Transactions on Wireless Communications, vol. 16, no. 12, pp. 7703-7717, Dec. 2017.
- Marcus Karlsson, Emil Björnson, Erik G. Larsson, “Jamming a TDD Point-to-Point Link Using Reciprocity-Based MIMO,” IEEE Transactions on Information Forensics & Security, vol. 12, no. 12, pp. 2957-2970, Dec. 2017.

- Amir Aminifar, Petru Eles, Zebo Peng, Anton Cervin, Karl-Erik Årzén: "Control-Quality Driven Design of Embedded Control Systems with Stability Guarantees", IEEE Design and Test, Issue 99, 2017
- Morteza Mohaqeqi, Mitra Nasri, Yang Xu, Anton Cervin, Karl-Erik Årzén: "Optimal Harmonic Period Assignment: Complexity Results and Approximation Analysis", Real-Time Systems Journal, 2018 (Accepted for publication)
- Gautham Nayak Seetanadi, Martina Maggio, Karl-Erik Årzén, Luis Almeida, Javier Camara: "Event-Driven Bandwidth Allocation with Formal Guarantees for Camera Networks", IEEE Real-Time Systems Symposium (RTSS), Porto, Portugal, 2017
- Yang Xu, Karl-Erik Årzén, Enrico Bini, Anton Cervin: "LQG-Based Control and Scheduling Co-Design", IFAC-PapersOnLine, 50:1, pp. 5895–5900, 2017
- Yang Xu, Anton Cervin, Karl-Erik Årzén: "Jitter-Robust LQG Control and Real-Time Scheduling Co-Design", American Control Conference, Milwaukee, WI, 2018
- Tommi Nylander, Cristian Klein, Martina Maggio, Karl-Erik Årzén: "BrownoutCC: Cascaded Control for Bounding the Response Times of Cloud Applications", American Control Conference, Milwaukee, WI, 2018
- Martina Maggio, Juri Lelli, Enrico Bini: "rt-muse : measuring real-time characteristics of execution platforms" Real-Time Systems Journal, 2017
- Stepan Shevtsov, Mihaly Berekmeri, Danny Weyns, Martina Maggio: "Control-Theoretical Software Adaptation: A Systematic Literature Review", IEEE Transactions on Software Engineering, PP:99, pp. –, 2017
- Emelie Engström, Kai Petersen, Nauman Bin Ali, Elizabeth Bjarnason: SERP-test: a taxonomy for supporting industry-academia communication. Software Quality Journal 25(4): 1269-1305 (2017)
- Nauman bin Ali, Muhammad Usman: Reliability of search in systematic reviews: towards a quality assessment framework for the automated-search strategy. Information and Software Technology (Accepted for publication in 2018)
- D. Falessi, N. Juristo, C. Wohlin, B. Turhan, J. Münch, A. Jedlitschka and M. Oivo: Empirical Software Engineering Experts on the Use of Students and Professionals in Experiments, Empirical Software Engineering: An International Journal, published online, June 8, 2017.
- D. Badampudi, K. Wnuk, C. Wohlin, U. Franke, D. Smite and A. Cicchetti: A Decision-making Process-line for Selection of Software Asset Origins and Components, Journal of Systems and Software, Vol. 135, No. 1, pp. 88-104, 2018.
- M. Usman, J. Börstler, K. Petersen: An Effort Estimation Taxonomy for Agile Software Development, International Journal of Software Engineering and Knowledge Engineering, 27(4):641-674, 2017.
- Gustaf Hendeby, Fredrik Gustafsson, Niklas Wahlström, Svante Gunnarsson, Platform for Teaching Sensor Fusion Using a Smartphone, International journal of engineering education, 33(2B): 781-789, 2017.
- Erik Hedberg, Johan Norén, Mikael Norrlöf, Svante Gunnarsson, Industrial Robot Tool Position Estimation using Inertial Measurements in a Complementary Filter and an EKF, IFAC World Congress 2017, 9-14 July, Toulouse, France., 2017.

- Yuxin Zhao, Carsten Fritsche, Feng Yin, Fredrik Gunnarsson, Fredrik Gustafsson, "Sequential Monte Carlo Methods and Theoretical Bounds for Proximity Report Based Indoor Positioning", IEEE Transactions on Vehicular Technology, 2018
- Michael Roth, Gustaf Hendeby, Carsten Fritsche, Fredrik Gustafsson, "The Ensemble Kalman filter: a signal processing perspective", EURASIP Journal on Advances in Signal Processing, 2017
- Yuxin Zhao, Carsten Fritsche, Feng Yin, Fredrik Gunnarsson, Fredrik Gustafsson, "Sequential Monte Carlo Methods and Theoretical Bounds for Proximity Report Based Indoor Positioning", IEEE Transactions on Vehicular Technology, 2018
- Michael Roth, Gustaf Hendeby, Carsten Fritsche, Fredrik Gustafsson, "The Ensemble Kalman filter: a signal processing perspective", EURASIP Journal on Advances in Signal Processing, 2017
- "Approximative Coding Methods for Channel Representations" by K. Öfjäll and M. Felsberg (joint first authorship) was accepted at Journal of Mathematical Imaging and Vision.
- " Binary Patterns Encoded Convolutional Neural Networks for Texture Recognition and Remote Sensing Scene Classification" was accepted at ISPRS Journal of Photogrammetry and Remote Sensing.
- Hu, S., Fredrik Rusek & Ove Edfors, Beyond Massive-MIMO: The Potential of Data-Transmission with Large Intelligent Surfaces, 2018 mar 16, IEEE Transactions on Signal Processing.
- Juan-Diego Sanchez, Avendal, J., Adnan Bibic & Buon Kiong Lau, Radiative MRI coil design using parasitic scatterers: MRI Yagi, 2018 mar, IEEE Transactions on Antennas and Propagation. 66, 3, s. 1570-1575
- Harris, P., Hasan, W. B., Liang Liu, Steffen Malkowsky, Beach, M., Armour, S., Fredrik Tufvesson & Ove Edfors, Achievable Rates and Training Overheads for a Measured LOS Massive MIMO Channel, 2018 jan 29, IEEE Wireless Communications Letters.
- Dahman, G., Jose Flordelis & Fredrik Tufvesson, Cross-Correlation of Large-Scale Parameters in Multi-Link Systems: Analysis using the Box-Cox Transformation, 2018 jan 24, I : IEEE Access.
- Hu, S., Fredrik Rusek & Ove Edfors, Beyond Massive MIMO: The Potential of Positioning with Large Intelligent Surfaces, 2018 jan 23, IEEE Transactions on Signal Processing.
- Jose Flordelis, Fredrik Rusek, Fredrik Tufvesson, Larsson, E. G. & Ove Edfors, Massive MIMO Performance - TDD Versus FDD: What Do Measurements Say?, 2018 jan, IEEE Transactions on Wireless Communications.
- Liu, Y., Liang Liu, Ove Edfors & Viktor Öwall, An Area-Efficient On-Chip Memory System for Massive MIMO Using Channel Data Compression, 2018, IEEE Transactions on Circuits and Systems I:
- Hu, S. & Fredrik Rusek, On the Design of Channel Shortening Demodulators for Iterative Receivers in Linear Vector Channels, 2018, IEEE Access. s. 48339 – 48359
- Carl Ingemarsson, Petter Källström, Fahad Qureshi, Oscar Gustafsson, "Efficient FPGA Mapping of Pipeline SDF FFT Cores", IEEE Transactions on Very Large Scale Integration (vlsi) Systems, 25(9): 2486-2497, 2017.
- Muhammad Fahim Ul Haque, Muhammad Touqir Pasha, Ted Johansson, "Aliasing-Compensated Polar PWM Transmitter", IEEE Transactions on Circuits and Systems - II - Express Briefs, 64(8): 912-916, 2017.

- Mario Garrido Gálvez, Miguel Angel Sanchez, Maria Luisa Lopez-Vallejo, Jesus Grajal, "A 4096-Point Radix-4 Memory-Based FFT Using DSP Slices", IEEE Transactions on Very Large Scale Integration (vlsi) Systems, 25(1): 375-379, 2017.
- Erik Bertilsson, Oscar Gustafsson, Erik G. Larsson, "Computation Limited Matrix Inversion Using Neumann Series Expansion for Massive MIMO", Asilomar Conf. Signals Systems and Computers, 466-469, 2017.
- Anton Kovalev, Oscar Gustafsson, Mario Garrido, "Implementation approaches for 512-tap 60 GSa/s chromatic dispersion FIR filters", Asilomar Conf. Signals Systems and Computers, 1779-1783, 2017.
- Oscar Gustafsson, Erik Bertilsson, Johannes Klasson, Carl Ingemarsson, "Approximate Neumann Series or Exact Matrix Inversion for Massive MIMO? (Invited Paper)", IEEE Symposium on Computer Arithmetic, Proceedings Symposium on Computer Arithmetic, 62-63, 2017.
- Oscar Gustafsson, "On Lifting-Based Fixed-Point Complex Multiplications and Rotations", 2017 IEEE 24th Symposium on Computer Arithmetic (ARITH), Proceedings Symposium on Computer Arithmetic, 43-49, 2017.

### Keynotes and Invited Talks:

- E.G. Larsson gave keynote "Massive MIMO: a Key Technology for 5G and Beyond" at the IEEE Nordic Circuits and Systems Conference, Linköping, October 2017.
- Emil Björnson (LiU/ISY/Communication systems) gave the IEEE 5G webinars: "Massive MIMO for 5G below 6 GHz: Achieving Spectral Efficiency, Link Reliability, and Low-Power Operation" (January 17, 2018) and "Massive MIMO for 5G: How Big Can it Get?" (November 9, 2017). Recordings are available online.
- Per Runeson gave a keynote on *Industry-Academia Communication in Empirical Software Engineering* at the 11th ACM / IEEE International Symposium on Empirical Software Engineering and Measurement in Toronto, Canada in November. He used the Berlin wall as a metaphor for the divide between industry and academia, and asked both practitioners and researchers to "tear down that wall". Presentation available at <https://www.slideshare.net/PerRuneson/industryacademia-communication-in-empirical-software-engineering>
- Fredrik Tufvesson gave a IEEE Communications Society webinar, "Maximising spectrum efficiency with massive MIMO in the 3 GHz band", Nov 2017
- Fredrik Tufvesson gave a Key note, workshop at PIMRC, "Channel characteristics for cooperative ITS and positioning" Oct. 2017
- J. Börstler: Software engineering education: Challenges and solutions. Keynote at the upcoming Workshop on Innovative Software Engineering Education, Ulm, Germany, March 2018.
- C. Wohlin: Software Engineering Research with and in Industry, Keynote at the yearly research seminar at Lero - The Irish Software Research Center, Athlone, Ireland.
- C. Wohlin: Can we trust the evidence?, Keynote at the upcoming the 22nd International Conference on Evaluation and Assessment in Software Engineering in Christchurch, New Zealand, June 2018.

- Isak Nielsen and Daniel Axehill. Low-rank modifications of Riccati factorizations for model predictive control. Accepted for publication in IEEE Transactions on Automatic Control, July 2017.
- Kosta, N. Pappas, V. Angelakis, Age of Information: A New Concept, Metric, and Tool, Foundations and Trends® in Networking 12 (3), 162-259, Nov. 2017
- I. Avgouleas, N. Pappas, D. Yuan, V. Angelakis. Probabilistic cooperation of a full-duplex relay in random access networks, IEEE Access 5, 7394-7404, 2017
- Z. Chen, N. Pappas and M. Kountouris. Probabilistic Caching in Wireless D2D Networks: Cache Hit Optimal Versus Throughput Optimal. IEEE Communications Letters, vol. 21, no. 3, pp. 584-587, Mar. 2017
- M. Ploumidis, N. Pappas and A. Traganitis. Flow Allocation for Maximum Throughput and Bounded Delay on Multiple Disjoint Paths for Random Access Wireless Multihop Networks. IEEE Transactions on Vehicular Technology, vol. 66, no. 1, pp. 720-733, Jan. 2017
- N. Pappas, J. Jeon, Di Yuan, A. Traganitis, A. Ephremides. Wireless Network-Level Partial Relay Cooperation: A Stable Throughput Analysis. IEEE/KICS Journal of Communications and Networks (JCN). (Accepted)
- N. Pappas, Z. Chen, I. Dimitriou. Throughput and Delay Analysis of Wireless Caching Helper Systems with Random Availability. IEEE Access. (Accepted)
- Q. He, D. Yuan, and A. Ephremides. Optimal link scheduling for age minimization in wireless systems. IEEE Transactions on Information Theory. (Accepted)
- I. Dimitriou and N. Pappas. Stable Throughput and Delay Analysis of a Random Access Network With Queue-Aware Transmission. IEEE Transactions on Wireless Communications. (Accepted)
- V. Angelakis, "Age and Value of Information in IoT systems", 4h tutorial at the 2017 Open Internet of Things Summer School, 4-8 Sep. 2017, Galway City, Ireland.
- Anders Hansson gave an invited talk on "Distributed Robustness Analysis" at the LCCC Focus Period on Large-Scale and Distributed Optimization in Lund, June 16, 2017.
- Michael Felsberg is invited as keynote speaker at keynote at CVCS 2018.
- Fahad Khan invited speaker at SSDL 2017.

### **Awards and Appointments:**

- E.G. Larsson appointed to the editorial board of the IEEE Signal Processing Magazine, 2018.
- E.G. Larsson appointed member of the IEEE Aerospace and Electronics Systems Society (AESS) Fellow Evaluation Committee (2018–2020).
- N. Pappas IEEE WiMob 2017 Workshops co-chair.
- N. Pappas co-chair for the IEEE SPAWC 2018 Special session "Low Latency Communications in Cooperative Networks".
- The paper Gradient-Based Recursive Maximum Likelihood Identification of Jump Markov Non-Linear Systems by Andre R. Braga, Carsten Fritsche, Fredrik Gustafsson, and Marcelo Bruno was second runner-up for the ISIF 2017 Tammy Blair Best Student Paper Award at the Fusion 2017 conference
- The paper Gradient-Based Recursive Maximum Likelihood Identification of Jump Markov Non-Linear Systems by Andre R. Braga, Carsten Fritsche, Fredrik Gustafsson, and Marcelo Bruno was

second runner-up for the ISIF 2017 Tammy Blair Best Student Paper Award at the Fusion 2017 conference

### **Program chairs and Editorships:**

- Nauman bin Ali served as the industry track co-chair for the 21st Annual Conference on Evaluation & Assessment in Software Engineering (EASE 2017, <http://ease2017.bth.se/organization>).
- Nauman bin Ali serves as one of the guest-editors for a special issue on empirical software engineering in Journal of Systems and Software.
- Nauman bin Ali served as a program committee member for International Workshop on Software Measurement (IWSM Mensura 2017, <http://www.iwsm-mensura.org/2017/Organization>).
- Mario Garrido is appointed associate editor for Journal of Signal Processing Systems

### **PhD theses:**

- Christopher Mollen (LiU/ISY/Communication systems) successfully defended his Ph.D. thesis "High-End Performance with Low-End Hardware: Analysis of Massive MIMO Base Station Transceivers", Jan. 2018
- Ahmad Nauman Ghazi (BTH). PhD Dissertation. Structuring Exploratory Testing through Test Charter Design and Decision Support. June 2017.
- Bogdan Marculescu (BTH). PhD Dissertation. Interactive Search-Based Software Testing: Development, Evaluation, and Deployment. Oct 2017.
- Ricardo Britto (BTH). PhD Dissertation. Strategizing and Evaluating the Onboarding of Software Developers in Large-Scale Globally Distributed Legacy Projects. Nov 2017.
- Johan Silvander (BTH). Licentiate Dissertation. Towards Intent-Driven Systems. Sep 2017.
- Mohsin Irshad (BTH). Licentiate Dissertation. Assessing Reusability in Automated Acceptance Tests. Feb 2018.
- Isak Nielsen, Structure-Exploiting Numerical Algorithms for Optimal Control, PhD dissertation, Linköping, 2017.
- Wadenbäck, M., Homography-Based Positioning and Planar Motion Recovery, 2017, Lund,
- Efficient Software Implementation of Stream Programs, Gustav Cedersjö, 2017, Lund
- Computer Vision Based Analysis of Animal Behavior, Palmér, T., 2017 feb 9, 1 red. Lund
- Modeling and Estimation Topics in Robotics, Fredrik Bagge Carlson, 2017 mar 10, Department of Automatic Control, Lund
- Inverted GUI Development for IoT with Applications in E-Health, Johnsson, B. A., 2017 apr 11, Department of Computer Science, Lund
- Applications of Machine Learning on Natural Language Processing and Biomedical Data, Dennis Medved, 2017 Lund
- Automatic Controller Tuning using Relay-based Model Identification, Berner, J., 2017, Lund
- LQG-Based Real-Time Scheduling and Control Codesign, Xu, Y., 2017, Lund
- Muhammad Fahim Ul Haque (LiU/ISY/Computer Engineering), "Pulse-Width Modulated RF Transmitters", Linköping Studies in Science and Technology. Dissertations, No. 1822, 2017.

## Conferences and workshops:

- OpenModelica Annual Workshop 2018  
Linköping University, February 5, 2018

- 12th MODPROD Workshop on Model-Based Cyber-Physical Product Development  
Linköping University, February 6-7, 2018

## Personell

- Dr. Christoph Reichenbach was recruited as senior lecturer in software technology in August 2017. He is recruited within the WASP program.
- Dr. Elizabeth Bjarnason was promoted to senior lecturer in software engineering, in December 2017.
- Sergio Rico from Colombia started Feb 1 as a PhD student in software engineering, co-supervised by ELLIIT post doc Emelie Engström. The focus is on developing methods for evaluating software test processes and proposing adequate and evidence-based improvements to them
- Vi Tran has been employed as a Ph.D. student since January 2018 at Blekinge Institute of Technology (January 2018).
- V. Angelakis – promoted to biträdande professor (Reader (UK) / Assoc. Prof. (US)) from 1 Dec. 2017 at Department of Science and Technology (ITN), LiU,
- Hamed Haghshenas has been recruited as a PhD student in the project Scalable Optimization for Control Systems at ISY, LiU
- Dr Shang Xiang from Shanghai Jiao Tong University (SJTU) will begin his two year postdoctoral employment at Lund University with Buon Kiong Lau (LU/EIT) in March 2018, funded by a Marie Skłodowska-Curie Actions (MSCA) Individual Fellowship. His project concerns several theoretical extensions of a computational electromagnetics technique called Characteristic Mode Analysis and using them to solve practical antenna design problems.

## Research Grants

- New ITEA3 EMPHYSIS project at LiU (<https://itea3.org/project/emphysis.html>).
- New SSF project in cyber security <https://strategiska.se/pressmeddelande/300-miljoner-till-cybersakerhet-en-strategisk-injektion/>
  - Martin Hell (LU/EIT) has received an SSF grant for the project "Secure Software Update Deployment for the Smart City" in the call "Cybersecurity and Information Security". Co-applicants are Christian Gehrman (LU/EIT) and Boris Magnusson (LU/CS). The awarded amount is 22 MSEK.
  - Christian Gehrman (LU/EIT) has received an SSF grant for the project "Cyber Security for Next Generation Factory" in the call "Cybersecurity and Information Security". Co-applicants are Martin Hell (LU/EIT), Maria Kihl (LU/EIT), Thomas Thelin (RISE SICS) and Ludwig Seitz (RISE SICS). The awarded amount is 30 MSEK.

- BTH: SHADE – En värdeorienterad strategi för hantering av degradering av mjukvarutillgångar, Funded by The Knowledge Foundation, Duration: April 1, 2018 – March 31, 2021. Total budget: 10.5MSEK.
- BTH: SHADE En värdeorienterad strategi för hantering av degradering av mjukvarutillgångar, Funded by The Knowledge Foundation, Duration: April 1, 2018 □ March 31, 2021. Total budget: 10.5MSEK.
- N. Pappas, "Low Latency Communications for Wireless Networks: Exploiting Traffic Characteristics", funded by the LiU Center for Industrial Information Technology (CENIIT).
- A. Ephremides, "Using message properties and structure to control latency in information systems ", funded by VR.
- Buon Kiong Lau (LU/EIT) received an SSF Mobility Grant to spend 50% of his time at nok9 AB for 1.5 years. nok9 is the official test equipment provider for the Qi standard of wireless charging, and wireless communication solutions are critical to the Qi charging solution.
- The Competence Center LINK-SIC (Linköping Center for Sensor Informatics and Control) has been approved by VINNOVA. The funding from VINNOVA is 32 MSEK over five years. The center involves the Divisions of Automatic Control and Vehicular Systems at Linköping University and some of Sweden's largest system-building industries.