News

ELLIIT triples in size!

In September 2019, the government announced in its fall budget an increase of ELLIIT with 72 Mkr, starting from 2020, thereby expanding the total volume of ELLIIT to over 100 Mkr. A starting point for the expansion will be the ELLIIT 2030 Technology Foresight. In early 2020, the ELLIIT board announced a call for pre-projects, receiving 84 proposals. Currently, the ELLIIT board is working on a new project structure.

ELLIIT workshop 2019 in Karlskrona

The 2019 ELLIIT workshop took place in October at BTH in beautiful Karlskrona, with local organizers Nauman bin Ali and Jürgen Börstler. The program offered two exciting keynotes: one by Anna Scaglione (Arizona State University) on Opinion Dynamics, and one by Paris Avgeriou (University of Groningen) on Technical Debt. The program furthermore included highlights from ELLIIT projects, parallel tracks on Systems modeling, Security&Testing, and Machine learning, mini workshops and poster sessions, as well as a visit to the Marine museum with its exhibition of submarines. See https://old.liu.se/elliit/workshop for details.

ELLIIT 2030 Technology Foresight

In July 2019, the ELLIIT 2030 Technology Foresight was printed, summarizing ELLIIT's general long-term vision, and outlines specific, new research directions that urgently need investments. The Foresight is available online here:
https://old.liu.se/elliit/startpage/1.764031/elliit-190706a-webb.pdf

ELLIIT-forskare varnar för komplexa coronamodeller

Flera datamodeller som har presenterats för att förutse smittspridning av covid-19 har varit väldigt komplexa – trots brist på validerat underlag. Det bör man vara varsam med skriver 15 forskare, från bl.a. ELLIIT i Lund och Linköping, i en debatt-artikel i Ny Teknik i april 2020. https://www.nyteknik.se/opinion/forskare-se-upp-med-komplexa-coronamodeller-de-kan-over traffa-verkligheten-6994339

Research Highlights

Estimating value of autonomus vehicle handling in terms of saved lives

Björn Olofsson (Div. Vehicular Systems, LiU and Dept. Automatic Control, LU) and Lars Nielsen (Div. Vehicular Systems, LiU) have presented research results from the ELLIIT project in the recently accepted paper "Using Crash Databases to Predict Effectiveness of New Autonomous Vehicle Maneuvers for Lane-Departure Injury Reduction" in IEEE Transactions on Intelligent Transportation Systems. In order to effectively estimate the number of accidents that would have been possible to avoid or mitigate by autonomous handling, a framework combining available historic data, in the form of crash databases, and statistical methods has been developed. It builds on our recent developments in obtaining optimal maneuvers, usually applied in autonomous vehicle handling, but now utilized to determine limits of vehicle behavior. The result is quantitative measures based on real data for the potential of saved lives by using autonomous vehicle maneuvers, and in the current paper it is applied to lane departure accidents.
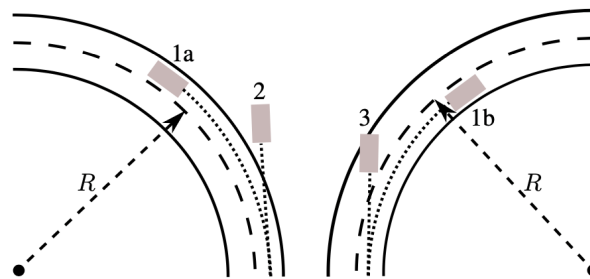
Link to paper: https://doi.org/10.1109/TITS.2020.2983553

Fig. 1. Possible situations when entering a left-hand or right-hand turn with radius R. Cases 2 and 3 can potentially result in accidents, whereas in Cases 1a and 1b the vehicle is able to stay in the desired driving lane.

Can we still be sure of something when control systems miss their deadlines?

Around April 2019, while Martina Maggio (LU/Control) was on sabbatical at Bosch corporate research, she started investigating what happens when controllers miss deadlines. The research was motivated by the transition to a new generation of processors (for some Bosch products), that led to the possibility of executing additional workload on the processor - coupling it with important functionality like the execution of control tasks. This additional workload was found beneficial, but at the same time increased the chances that the controller code would not have enough time to execute properly (i.e., before its deadline).

After some work, Martina and her collaborators have been able to derive a stability condition for systems where the controller can miss up to a maximum given number of consecutive deadlines. This reinforces the belief that controllers are designed to be robust, not only to environmental fluctuations and disturbances, but also to computational problems, like deadline misses. The research resulted in a publication that is available as a preprint.

Målet med ELLIITs nyhetsblad är att sprida information om händelser och nyheter från ELLIIT. Nyhetsbladet är skrivet på en blandning av svenska och engelska.

Highly efficient decade frequency range radio frequency power amplifier

Jonas Lindstrand (LU/EIT) has designed and demonstrated in measurements a novel power amplifier concept achieving the desirable combination of extremely wide bandwidth and high efficiency. The circuit is implemented in standard 65nm CMOS technology and has a decade frequency range, from 0.6 to 6GHz, and has just been published in IEEE Microwave and Wireless Components Letters (2020). The amplifier is injection locked and uses supply modulation, and features two separate off-chip output matching networks to achieve high efficiency over the decade bandwidth. The output power exceeds 26.6dBm over the 0.6 to 6GHz frequency range, and the efficiency exceeds 49%. With a modulated LTE signal, an output power of 19dBm was achieved at 40% power added efficiency and an ACLR better than -31dB.
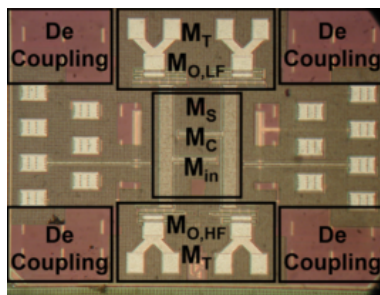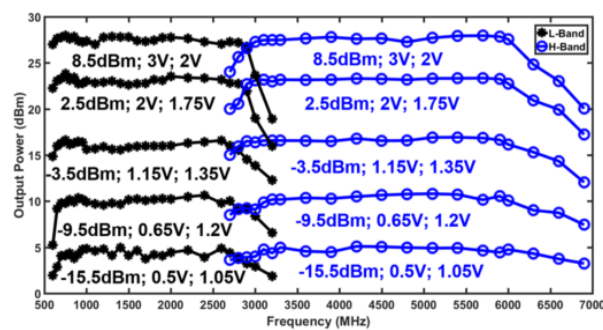
Chip photo   Measured frequency response

New release of OpenModelica

OpenModelica is an Open Source Environment for Object-Oriented Equation-Based Modeling, Simulation, and Analysis of Cyber-physical systems, developed at LiU/IDA. A new release 1.14 of the system was published in December 2019. It features a new compiler frontend, which on the average gives a factor of 10-20 speed improvement in the flattening phase of compilation. Furthermore, around 200 issues have been fixed, including a number of enhancements, compared to the previous 1.13.2 release. See www.openmodelica.org

Progress in deriving models for Age of Information in computer networks

ELLIIT researchers Björn Landfeldt and Antonio Franco at LU/EIT have made progress in deriving mathematical models for Age of Information, a relatively new concept for determining performance of computer networks. With the AoI concept, the focus is shifted from networking latency to a combination of the networking queuing and forwarding behaviour and the information generation process, combined a view of the freshness of data that arrives at a receiver. Among the publications over the past year, two have been selected as best paper candidates in leading conferences, (ACM MSWIM 2019 and IEEE IPCCC 2019).

Advances in mobile malware detection
ELLIIT researchers at LiU have published a paper in the AISec workshop (co-located with ACM CCS'19) on using machine learning to identify string obfuscation in mobile apps, which is an important sub problem in mobile malware detection. We show that traditional classification-based approaches is unsuitable for the task and propose a novel anomaly-detection-inspired method. Ref: Alireza Mohammadinodooshan, Ulf Kargén and Nahid Shahmehri. Robust Detection of Obfuscated Strings in Android Apps. In Proceedings of the 12th ACM Workshop on Artificial Intelligence and Security, 2019, pp. 25-35.
On a side note, we have also published an arXiv comment paper on a publication in a prominent journal that also addresses the above problem of ML-based obfuscation detection in apps. We discuss how great care must be taken when selecting and organizing training data for such purposes, in order to avoid misleading results. Link: https://arxiv.org/abs/1910.06192

EU Results in Brief article on mobile network planning and optimisation
The EU project DECADE (coordinated by Di Yuan, LiU/ITN) has been selected for a Results in Brief article published by the EU. The article explains how mathematical tools and software models help to optimise heterogeneous networks (HetNets) that integrate radio base stations of various types.
https://cordis.europa.eu/article/id/413387-mathematical-tools-and-software-models-help-to-optimise-heterogeneous-networks

Invited Talks

- Emil Björnson (LiU/ISY) gives Keynote at the 2019 GTTI Annual Meeting, Pavia, Italy, June 27, 2019: "MIMO Technology for 5G and Beyond".
- Emil Björnson (LiU/ISY) gives Keynote at the 5G Italy PhD School, Rome, Italy, December 3, 2019: "Communication Using Intelligent Reflective Surfaces: Myths and Realities"
- Michael Felsberg (LiU/ISY) will give two keynotes, one at the CVPR IEEE Workshop on Perception Beyond the Visible Spectrum 2020 (http://vcipl-okstate.org/pbvs/20/) and one at ISCMI Conference 2020 (http://iscmi.us/keynote.html).
- E.G. Larsson (LiU/ISY) gives Keynote at the 16th International Symposium on Wireless Communications Systems (ISWCS), Oulu, Finland, August 28, 2019: "Physical layer for next generation wireless: Lessons learned from 5G and directions for 6G".
- Claes Wohlin, BTH was invited to give a talk at the Faculty Winter Seminar for the Faculty of Computer Science at the Free University of Bozen-Bolzano, Italy in January 2020.
- Kai Petersen, BTH gave a tutorial for Sintef, Norway on systematic reviews and mapping studies
- Prof. Jonas Unger, Department for Science and Technology at Linköping University, was invited speaker in the Autonomous Driving workshop at the International Conference on Computer Vision (ICCV) 2019 held in Seoul, Korea in October 2019. The focus was on synthetic data for street scene parsing and machine learning.

- Dr. Nikolaos Pappas (LiU/ITN) has been invited speaker at CISS 2020 on the special session on Age of Information (AoI).
- Dr. Nikolaos Pappas (LiU/ITN) gave an invited talk at Science Pop up Expo at Mjardevi Science Park, November 2019.

Invited lecture on optimal maneuvers at CAV2019

Lars Nielsen (LiU/ISY) gave an invited plenary lecture at the 3rd IAVSD Workshop on Dynamics of Road Vehicles, Ann Arbor, Michigan, USA, in April 2019, with the title "Using optimization for obtaining and analyzing at-the-limit maneuvers". The talk presented research from the ongoing ELLIIT project and gained significant attention among the audience consisting of world-leading researchers on vehicle autonomy from academia, representatives from major automotive companies, and important policy makers.
Link to conference: http://cav2019.engin.umich.edu

Awards and Appointments:

Lilla Polhemspriset to ELLIIT-based Master's Thesis

Richard Bai and Karl Fredrik Erliksson, M.Sc. students at Dept. Automatic Control, LU, were awarded Lilla Polhemspriset 2019 for best Master's Thesis at engineering programs in Sweden. The thesis has the title "Motion Planning using Positively Invariant Sets on a Small-Scale Autonomous Vehicle" and was performed in cooperation between AB Berntec and the Robotics Lab shared by Dept. Automatic Control and Dept. Computer Science, LU. The project was supervised by Björn Olofsson (Dept. Automatic Control, LU and Div. Vehicular Systems, LiU) and Karl Berntorp (AB Berntec) and examined by Anders Robertsson (Dept. Automatic Control, LU).
Link to the thesis: http://lup.lub.lu.se/student-papers/record/8956065

ITEA Award of Excellence

The OPENCPS project coordinated by Saab and Linköping University, PELAB for which OMSimulator was the major result, received the ITEA award of excellence, September 2019. ITEA Vice-chairman, Philippe Letellier referred to the major results delivered by the project, calling it "a milestone on the path of open and standardised co-design and simulation of complex systems, that delivers major results".

- E. G. Larsson and E. Björnson (LiU) together with T. Marzetta, NYU receive the *IEEE ComSoc Fred W. Ellersick Prize*, 2019
- E. Björnson (LiU) together with Mats Bengtsson and Björn Ottersten, KTH, receive the IEEE Signal Processing Magazine *Best Column Award*.
- E. Björnson (LiU) receive the 2019 EURASIP *Early Career Award* for "significant contributions to multi-antenna communications and open science".
- Michael Felsberg (LiU) has been appointed as *Honorary Professor* at the School of Engineering, University of Kwazulu-Natal, South Africa.
- Martin Danelljan (LiU) receives the *best Nordic PhD Thesis* 2017/2018 award in image analysis, see https://ssba.org.se/scia2019/#prizes.
- Martina Maggio (LU/Control) received the *Outstanding Reviewer Award* at the International Conference on Performance Engineering (ICPE) 2020.
- Christoph Reichenbach, LU/CS, received a *Distinguished Reviewer Award* at the 34th IEEE/ACM International Conference on Automated Software Engineering (ASE 2019), held in San Diego, Nov 2019.
- Christoph Reichenbach, LU/CS, received a *Best Presentation Award* at the 8th ACM SIGPLAN International Workshop on the State Of the Art in Program Analysis (SOAP 2019), co-located with PLDI in Phoenix, Arizona, in June 2019.
- The paper "Search Strategy to Update Systematic Literature Reviews" by BTH researchers Emilia Mendes and Claes Wohlin and co-authors Marcos Kalinowski and Katia Romero Felizardo from Brazil, received the *best paper award* at the Euromicro conference on Software Engineering and Advanced Application in Kallithea Halkidiki, Greece in August 2019.
- The paper "A Comparison of Issues and Advantages in Agile and Incremental Development between State of the Art and an Industrial Case" by Kai Petersen and Claes Wohlin both from BTH was in *top three of the ten-year Most Influential Paper Award* in the Journal of Systems and Software, i.e. for papers published in the journal in 2009. Link: https://medium.com/jss-editors-selection/and-the-winner-is-4035bc044fb7
- The paper "Understanding the order of agile practice introduction: Comparing agile maturity models and practitioners' experience" by BTH researchers (I Nurdiani, J Börstler, S Fricker, K Petersen, P Chatzipetrou), published in the Journal of Systems and Software (JSS) has *been invited for a presentation at "JSS Happy Hour"*. The "JSS Happy Hour" event is being organized to compensate for the cancelled international conference on software engineering. The paper was selected for its high download statistics, topic and overall quality. A short video of the paper will be presented and discussed by an expert panel at the event.

Program chairs and Editorships

- Martina Maggio, LU/Control, serves as program co-chair for the International Conference on Cyber-Physical Systems (ICCPS) 2020
- Christoph Reichenbach, LU/CS, serves as program co-chair for SOAP 2020 (the 9th ACM SIGPLAN International Workshop on the State Of the Art in Program Analysis, to be held online in conjunction with PLDI 2020, in June 2020).
- Christoph Reichenbach, LU/CS, serves as guest editor for a special issue of the Journal of Computer Languages
- Michael Felsberg, LiU, has been acting as Area Chair at BMVC 2019 and CVPR 2020.
- Kai Petersen, BTH, is chair for the agile method track at the 13th International Conference on the Quality of Information and Communications Technology, 2020
- Together with researchers at the University of Turin, Tom Ziemke, IDA/LiU, guest-edited a special issue on *"Cognitive Aspects of Interactive Technology Use: From Computers to Smart Objects and Autonomous Agents"* for the journal *Frontiers in Psychology*
- Program chairs for OpenModelica workshop 2020. Martin Sjölund and Adrian Pop, PELAB/LiU
- Emelie Engström LU/SERG was appointed associate editor of TOSEM (ACM Transactions on Software Engineering and Methodology) in April 2020
- ELLIIT researchers from HH, Walid Taha, Abd-Elhamid M. Taha, and Johan Thunberg, have published a new book (in press), Cyber-Physical Systems: A Model-Based Approach. See https://www.springer.com/gp/book/9783030360702

PhD and licentiate theses

- Daniel Verenzuela, Exploring Alternative Massive MIMO Designs: Superimposed Pilots and Mixed-ADCs, Linköping University, Feb 2020
- Saghi Hajisharif, Computational Photography: High Dynamic Range and Light Fields, Linköping University, February 2020
- Trinh van Chien, Spatial Resource Allocation in Massive MIMO Communications: From Cellular to Cell-Free, Linköping University, Jan 2020
- Amanda Berg, "Learning to Analyze what is Beyond the Visible Spectrum", Linköping Studies in Science and Technology. Dissertations, No. 2024, 2019. Supervisor: Michael Felsberg.
- Jonas Lindstrand, Integrated Transmitters for Cellular User Equipment–Wideband CMOS Power Amplifiers and Antenna Impedance Tuners, Lund University, Nov 2019
- M. Reza Sadeghifar, Studies on Selected Topics in Radio Frequency Digital-to-Analog Converters, Linköping University, November 2019
- Marcus Klang, Building Knowledge Graphs: Processing Infrastructure and Named Entity Linking, Lund University, Oct 11 2019
- Erik Bengtsson, Massive MIMO from a terminal perspective, Lund University, Sept 2019
- Ulf Kargén, Scalable Dynamic Analysis of Binary Code, Linköping University, Sept 2019

- Johan Linåker, Guiding Development of Contribution and Community Strategies in Open Source Software Requirements Engineering, Lund University, Sept 2019.
- Anders Andersson. (June 4, 2019) Distributed Moving Base Driving Simulators – Technology, Performance, and Requirements. Linköping Studies in Science and Technology, Dissertation No. 1984.
  http://urn.kb.se/resolve?urn=urn:nbn:se:liu:diva-156537
- Süleyman Savas, Hardware/Software Co-Design of Heterogeneous Manycore Architectures, Halmstad University, May 2019
- Bertil Grelsson, Vision-based Localization and Attitude Estimation Methods in Natural Environments, Linköping University, April 2019
- Sardar Muhammad Sulaman, Evaluating and Improving Risk Analysis Methods for Critical Systems, Lund University, Feb 2019
- Mahder Gebremedhin, Automatic and Explicit Parallelization Approaches for Equation Based Mathematical Modeling and Simulation, Linköping University, Jan 2019
- Nesma Rezk, Exploring Efficient Implementations of Deep Learning Applications on Embedded Platforms, Licentiate thesis, Halmstad University, June 2020.
- Alfred Åkesson, ComPOS - a development environment for composing internet-of-things services. Licentiate thesis, Lund University, Dec 2019
- Emmanouil Fountoulakis defended his Licentiate thesis, Linköping University, ITN, October 2019.

Organized conferences and workshops

Modelica Jubilee Symposium – Future Directions of System Modeling and Simulation
In September 2019, a jubilee symposium was held in Lund, in celebration of the 100th Modelica Design Meeting. The symposium was organized by The Modelica Association, Modelica companies in Lund, and Lund University (including ELLIIT researchers Anton Cervin and Görel Hedin). Invited outstanding researchers and industrial practitioners from different communities presented their view on status, trends, and forthcoming developments. The presentations were recorded, and slides and videos are available at https://modelica.github.io/Symposium2019/ .

New Visual Object Tracking Challenge (VOT2020)
Also this year, the VOT-committee, with members Michael Felsberg (LiU) and Martin Danelljan (PhD from LiU 2018), has organized international challenges on tracking in video and multi-modal streams. The results will be presented at the ECCV-workshops 2020 in Glasgow. Further details on https://www.votchallenge.net/vot2020/.

- Workshop on Wireless Vehicular Communications, WWVC 2019. Halmstad Dec 2019.
  https://www.hh.se/english/about-the-university/events/workshop-on-wireless-vehicular-communications-wwvc-2019.html

- Dr. Nikolaos Pappas will organize a Special Session on Age of Information (AoI) at ISWCS 2020 (postponed to the next year).

- LiU researchers have been in the organizing committee of SCIA 2019 (https://ssba.org.se/scia2019/): Jonas Unger (General Chair), Per-Erik Forssén and Michael Felsberg (Program Chairs). Michael Felsberg has also been co-organizer of the ICCV workshop on Visual Object Tracking 2019 (https://www.votchallenge.net/vot2019/).

- The Scandinavian Conference on Image Analysis, SCIA 2019, was held in Norrköping in June 2019. The conference, was co-chaired by ELLIIT researchers Prof. Jonas Unger and Prof. Michael Felsberg. The Scandinavian Conference on Image Analysis (SCIA) is a biennial conference on computer vision, image analysis, and pattern recognition. It has been held since 1980 in the scandinavian countries Sweden, Denmark, Norway and Finland. http://www.ssba.org.se/scia2019/

- The Eurographics and EuroVis conferences are held in Norrköping May 2020. The conferences, are co-chaired by ELLIIT researchers Prof. Jonas Unger, Prof. Ingrid Hotz, and Prof. Anders Ynnerman. For the first time the two conferences Eurographics and Eurovis will run together, as a single event EGEV 2020. https://conferences.eg.org/egev20/

- Anton Cervin, LU/Control, was co-chair for the 2nd Workshop on Fog Computing and the IoT (Fog-IoT 2020) on April 21. Originally a satellite event to the CPS-IoT Week 2020 in Sydney, it was converted into an online workshop due to the pandemic. The open proceedings of the workshop are available at https://drops.dagstuhl.de/opus/portals/oasics/index.php?semnr=16142

- OpenModelica Annual Workshop February 3, 2020, at Linköping University. https://www.openmodelica.org/events/openmodelica-workshop/openmodelica-program-2020. Program chairs: Martin Sjölund and Adrian Pop (Dept. Computer and Information Science, Linköping University)

- 14th MODPROD Workshop on Model-Based Cyber-physical Product Development. Linköping University, February 4-5, 2020. www.modprod.se

- The Mobile Telecommunication (MT) group at the Communications and Transport Systems (KTS) division of LiU was in charge of organizing the 11'th Nordic Workshop on Systems and Network Optimization for Wireless Communication (SNOW2020). The workshop (https://liu.se/en/research/snow-conference-2020) covers a range of topics within wireless networking from fundamental information theoretic results to multimedia quality-of-service, from physical layer to application layer, and from fundamental to application-oriented research. Unfortunately, just two weeks before the planned date the workshop had to be cancelled due to the COVID-19 threat.

- ELLIIT researchers at HH organized a Halmstad Colloquium given by Prof. Fritz Henglein, from University of Copenhagen, on Smart digital contracts for next-generation distributed ledger technology. The talk is available online at https://www.youtube.com/watch?v=5HI-M7Uikfg

Personnel

- Nauman bin Ali was appointed docent at BTH in January 2020.
- Emma Fitzgerald har blivit befordrad från forskare till lektor vid EIT/LU.
- Marco Marinho started as a postdoc at HH in September 2019 (radio localization)
- Dr. Muhammad Usman has joined ELLIIT at BTH as a researcher in 2019
- ELLIIT researcher Michael Doggett (LU/CS), is back to Lund in March 2020 after a sabbatical at Facebook Reality Labs in Seattle, where he worked on low-power graphics hardware research for future Augmented Reality products from Facebook that build on the Oculus line of Virtual Reality headsets.
- Luigi Nardi, previously at Stanford, has received a WASP starting grant and started as associate senior lecturer at LU/CS in September 2019.
- Lucas Neves Egidio started as a postdoc at the Division of Automatic Control, LiU, in February 2020.
- Amanda Berg has been appointed a part-time postdoc position at CVL (LiU), shared with a part-time position in industry.
- Maike Klöckner has started as a postdoc at LU/CS from October 2019
- Bjarne Grossmann has started as a researcher at LU/CS from January 2020 to work on a WASP WALP project.
- Suleyman Savas has started as a postdoc at LU/CS from October 2019. He maintains his previous affiliation with HH on a part-time position. He will be working on research related to the Stream-Computing Infrastructures ELLIIT project. His research interests are in computer architecture, specifically for processor arrays and accelerators, and in virtual platforms and prototyping.
- Galina Sidorenko started as a PhD student at HH in September 2019 (V2X communications, cooperative driving)
- Sundas Munir started at HH in December 2019 as a PhD student to work on practical analysis of smart contracts.
- Adha Hrusto started at LU/CS in September 2019 as a WASP industrial Ph.D. student to work on continuous system testing and monitoring
- Johan Oxenstierna started at LU/CS in Nov. 2019 as a WASP industrial Ph.D. student
- Qunying Song started at LU/CS in January 2020 as a WASP Ph.D. student to work on continuous testing of autonomous systems
- Idriss Riouak started at LU/CS in November 2019 as a WASP Ph.D. student, to work on explainable declarative program analysis.
- Momina Rizwan started at LU/CS in January 2020 as a WASP Ph.D. student, to work on domain-specific languages for autonomous robots.
- Faseeh Ahmad started at LU/CS in March 2020 as a WASP Ph.D. student.
- Sofia Thunberg started in June 2019 as a PhD student in the Cognition & Interaction Lab at IDA/LiU, to work on the use of social robots in elderly care (main supervisor. Tom Ziemke). She collaborates with several elderly care homes and municipalities around Östergötland. Sofia also leads LiU's social robotics competition team in the RoboCup@Home competition, with support from ELLIIT.
- John Tinnerholm started as PhD student at PELAB/LiU, May 2019.

Research Grants

ERC Advanced Grant
Anders Rantzer, professor i reglerteknik på LU, har fått Europeiska forskningsrådets mest prestigefyllda anslag, en ERC Advanced Grant på drygt 2.5 MEUR med start den 1 september 2019. Projektet ska göra reglertekniken bättre anpassad för storskaliga system, vilket är nödvändigt för att förverkliga målet om ett fossilfritt Sverige.
Se https://www.lth.se/article/forskare-kammar-hem-prestigefyllda-maangmiljonbelopp/

- Emil Björnson (LiU) wins the 2020 Future Research Leader Grant from the Swedish Foundation for Strategic Research (SSF).
- Emma Söderberg (LU/CS) wins the 2020 Future Research Leader Grant from the Swedish Foundation for Strategic Research (SSF).
- Emil Björnson (LiU) was appointed a Wallenberg Academy Fellow 2019.
- Erik G. Larsson (LiU) wins grant from the Swedish Research Council (VR) for research on adversarial attacks on machine learning for the wireless physical layer.
- Emil Björnson (LiU) wins grant from the Swedish Research Council (VR) for research on improving the spectral efficiency of future wireless technologies by utilizing large antenna arrays and spatial channel properties.
- Emma Söderberg (LU/CS) wins 3.4 MSEK grant from the Swedish Research Council (VR etableringsbidrag) for research on adaptive development tools.
- Prof. Jonas Unger, Department for Science and Technology at Linköping University, was awarded a 4MSek personal research grant from the Knut and Alice Wallenberg foundation, KAW. The research will focus on sparse representations and compressed sensing for imaging applications.
- LARGEDYN - Modeling and Simulation Tool for Very Large Systems with Possibly Dynamic Structures. Peter Fritzson, Linköping University. 7 MSEK. A 3-year project May 1 2019 – April 31, 2022.
- EMBrACE - Environment for model-based rigorous adaptive co-design and operation of CPS https://itea3.org/project/embrace.html   European ITEA3 project. 20 partners. Nov 2019 – Dec 2022. Project leader: Lena Buffoni, Linköping University.
- Håkan Johansson (LiU), in collaboration with ReQuTech and Forsway, wins grant from VINNOVA within the strategic innovation program Electronic Components and Systems, for a project on array antennas for satcom applications on mobile platforms
- CVL at LiU has acquired Vinnova funding for several projects on Multi-dimensional Image Databases and 3D Point-cloud Processing (Per-Erik Forssén and Michael Felsberg).
- Muhammad Usman, Deepika Badampudi and Claes Wohlin, BTH received a three-year research grant (3.7 MSEK) for the project "Open Source Inspired Reuse" from the Knowledge Foundation for three years starting March 2020.
- Together with researchers at RISE SICS East, Tom Ziemke (LiU) started a new research institute PhD project on *"Human Interaction with Intelligent Systems-of-Systems"*, funded by SSF (2.5 mkr). The new PhD student (Oscar Bjurling, RISE) focuses on human operators' interaction with swarms of drones.

- Nikolaos Pappas, LiU/ITN: StandICT Network Architecture for the Tactile Internet 85 kSEK for 2019.
- Nikolaos Pappas, LiU/ITN: VR IndoSwedish: Physical Layer Secrecy for IoT Networks with Heterogeneous Traffic 700kSEK for 2020-2021.
- Per Runeson, LU/CS: ESS Control System Data Lab. En pilotstudie i samverkan mellan ESS, Lunds universitet, företaget GoalArt och Big Science Sweden. Projektet är finansierat av Vinnova, WASP (Wallenberg Artificial Intelligence, Autonomous Systems and Software Program) och Region Skåne. https://www.bigsciencesweden.se/sv/aktuellt/nyheter/ess-control-system-data-lab-ger-mojl igheter-for-forskning-teknikoverforing-och-innovation-inom-ai-open-data-och-framtidens- fabriker/