INDUSTRY CLUB

industryclub.control.lth.se // newsletter No 5

The Automatic Control Industry Club: Exploring, Expanding and Applying Control Technology

Welcome to Newsletter No 5, September 2022

In the newsletter we present interesting new developments at our department, and report about advances in the field of automatic control, as well as opportunities for collaborations.

We welcome you to be a part of this!

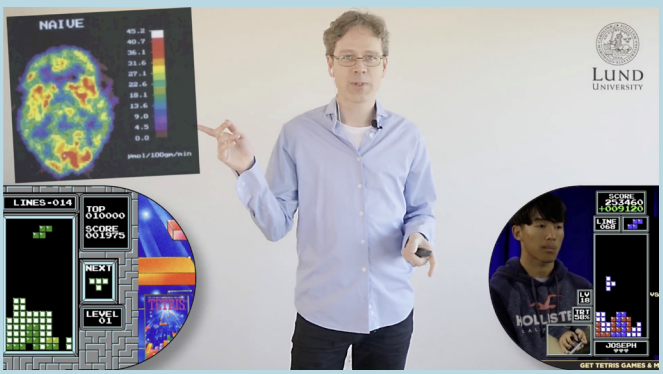
Industry Club

The Industry Club is an initiative to build an ecosystem around the Department of Automatic Control at Lund University. We want the Industry Club to be a forum for sharing ideas and getting feedback on the research we do. We want to reach out to the industry and other organizations to collaborate on new projects and initiate new research collaborations. The interface of the Industry Club will be a recurring newsletter, a webpage, and online and live events.

Highlights from the department

Interesting topics are being discussed on a daily basis at the department. Here are a few examples of recent topics that we would like to highlight.

- *Reading Your Thoughts.* The research group working on brain computer interfaces work to interpret EEG signals obtained using sensors placed on the outside of the head. A video from Pex Tufvesson, who is an industrial PhD-student working with Ericsson, explains what potential brain-computer interfaces we have, and how well they work today.



- *Master program.* This autumn, approx. 20 new students started the master program in "Machine Learning, Systems and Control" out of more than 640 applicants. The program is managed by Mikael Nilsson (Centre for Mathematical Sciences) and Bo Bernhardsson (Department of Automatic Control).
- *Master theses.* Can car batteries be used to support the energy transition? Storage is a key ingredient in the renewable energy transition. Building energy storage is expensive, so how can we make the most of existing sources of storage, such as batteries in electrical vehicles? In conjunction with emulate.energy, masters thesis students Gustav Sundell and Fredrik Sidh investigated the use of machine learning methods to predict human usage of electric vehicles, and quantify the storage available from electric vehicles for use in frequency regulation and peak shaving. Read more about the work at this link.

Highlights from the control world

We frequently attend control conferences, events and meetings around the globe. Below you'll find a glimpse of what we consider the most valuable take-aways.

- *The European Control Conference -- and uncertainty quantification.* ECC, the European Control Conference, was held in London in July 2022, and included many presentations covering many aspects of control, both in theory and practice. One tool that seem widely used is Gaussian Processes, used to learn a nonlinear model and quantify the uncertainty of the model. A plenary session by Sandra Hirche used Gaussian processes in rehabilitation to adapt to the needs of the individual. One potential issue with Gaussian Processes is that computational requirements grow with the amount of data, and Hirche used a tree of local Gausian Processes to keep latency low.

- *Department alumni Daria Madjidian obtains funding for company.* The accelerator start-up Emulate Energy, recently got substantial funding of 22mSEK. The company is founded by our alumni Daria Madjidian (PhD No 103) and his partner Shwan Lamei (also an alumni from LTH). **Emulate Energy** has developed an algorithm that emulates a physical battery by utilizing changes in the electrical demand. The core technology is a spin-off from the academic research conducted at MIT by Daria Madjidian during his post-doc period. More info.
- *Stockholm Workshop* on Emerging Topics in Systems and Control was held at KTH Royal Institute of Technology, Stockholm, during June 15-16, 2022. The focus of the workshop was on emerging topics in learning-based control, networked systems, nonlinear control theory, distributed control, and large-scale systems with applications ranging from robotics and aerospace to urban traffic networks and power systems.
- *Karl Johan Åström receives IFAC Technical Committee 9.4 Award for Control Education lifetime achievement.* This award is presented to Karl Johan Åström for educating and inspiring generations of control engineers around the world based on his outstanding books and publications, impactful educational materials and 'industry is my laboratory' concept. He is also awarded for explaining control ideas to non-specialists and applying control ideas in emerging new disciplines.

Upcoming opportunities

- *Would your company like to host an Master thesis project?* Soon many students will be looking for master thesis projects in automatic control and machine learning. Hosting an MSc thesis project is our most common form of collaboration with the industry. An MSc thesis project corresponds to 20 weeks of full-time studies, and the topic should be related to systems and control engineering. It can include modelling and simulation, machine learning, design and optimization, as well as real-time implementation. An event will take place on November 3rd, 13-15 at MA:5. Interested? Please contact Bo Bernhardsson if you want to join. See our website or contact us for more information.
- *Do you have a suitable PhD candidate at your company?* Wallenberg AI, Autonomous Systems and Software Program (WASP) is Sweden's largest individual research program ever and provides unique opportunities for achieving international research excellence with industrial relevance. The program is funded by the Knut and Alice Wallenberg Foundation. WASP will announce two calls the coming spring, one for a traditional PhD candidate position and one for an industry-PhD candidate position. More info will be made available on the homepage of WASP. Please also contact Professor Karl Erik Årzén if you are curious and want more information.
- *Welcome to attend our upcoming PhD defences.* This autumn we have 5 candidates that will defend their academic work. Oct 28, Christian Rosdahl will defend his licenciate thesis *Learning Control with Applications to HVAC Systems.* Nov 18, Johan Ruuskanen will defend his doctoral thesis *Dynamical Modeling of Cloud Applications for Runtime Performance Management.* Nov 25, Martin Morin will defend his doctoral thesis *Fixed Point Iterations for Finite Sum Monotone Inclusions.* Dec 15, Hamed Sadeghi will defend his doctoral thesis *Efficient and Flexible First-Order Optimization Algorithms.* Dec 16, Claudio Mandrioli will defend his doctoral thesis *Control-Theoretical Perspective on Feedback-Based Systems Testing.*

WELCOME BACK TO AN INTERESTING AUTUMN

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