

The Second Annual Conference on Learning for Dynamics and Control

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1. Introduction

Over the past decade, machine learning has had tremendous impact in numerous areas such as computer vision and language translation. Over the next decade, the biggest generator of data is expected to be devices which sense and control the physical world. This explosion of real-time data that is emerging from the physical world requires a rapprochement of areas such as machine learning, model-based dynamical systems, and control and decision theory. While control theory has been firmly rooted in the tradition of model-based design, the availability and scale of data (both temporal and spatial) will require rethinking of the foundations for our discipline. From a machine learning perspective, one of the main challenges going forward is to go beyond pattern recognition and address problems in data driven control and decision making as well as and learning-based-optimization of dynamical processes.

While this research agenda is very important for the future of various areas (control, optimization, reinforcement learning, data-driven decision learning), there is no natural home that brings together researchers in one forum in order to advance the state of the art in Learning in Dynamical and Control Systems. Conferences such as the IEEE Conference on Decision and Control have a small but growing group of researchers interested in learning-based control, safe learning, or constrained learning. In core machine learning conferences such as NIPS, COLT, and ICML, there is limited interest in learning over dynamical and decision systems. Many researchers in other related areas (signal processing, optimization, robotics) have growing efforts on the interface with machine learning, emphasizing mostly prediction and less decision making in dynamic systems. While the newly developed Conference on Robot Learning (CoRL) is also addressing issues at this interface, there has been significantly less focus on foundational research at this interface, and more on the application of learning to robotics.

As can be seen above, while there is a growing interdisciplinary community of researchers interested in Learning for Dynamical and Control Systems, the community is dispersed across many conferences. Our goal for L4DC is to create a forum that brings together pioneers and state of the art research in the areas of control systems, optimization, machine learning, and related disciplines in order to create a prestigious annual conference that defines the state-of-the-art in Learning for Dynamical and Control Systems. An elite conference on this topic can have tremendous impact not only scientifically by bridging two distant areas but also from a community perspective that nurtures a growing number of junior researchers working on this emerging interface. A conference across control, optimization and learning will provide a natural home for professional development for students and faculty that may feel marginalized in the current conference landscape.

Following the success of the inaugural L4DC workshop 2019 at MIT, the 2nd Annual Conference on Learning for Dynamics and Control (L4DC 2020) took place during, June 11-12, 2020, in a virtual forum hosted at UC Berkeley. In the long term, we would like to sustain this event as an annual conference where best results on this emerging interface are presented. We aim to create a new community of people that think rigorously across the disciplines, ask novel fundamental questions, and develop the foundations of this new scientific area.

2. Conference Scope

The conference focused on the foundations and applications of Learning for Dynamical and Control Systems. This year, in addition to a series of invited talks, we invited submissions of short papers which are enclosed in this proceedings. These papers address topics including, but not limited to foundations of learning of dynamics models, optimization for machine learning, data-driven optimization for dynamical systems, distributed learning over distributed systems, reinforcement learning for physical systems, safe reinforcement learning and safe adaptive control, statistical learning for dynamical and control systems, bridging model-based and learning-based dynamical and control systems, physics-constrained learning. We solicited papers applying learning and dynamical systems concepts to diverse areas including robotics, autonomy, transportation systems, cognitive systems, cognitive systems, and neuroscience. While the conference was open to any topic on the interface between machine learning, control, optimization and related areas, its primary goal was to address scientific and application challenges in real-time physical processes modeled by dynamical or control systems.

3. Inaugural Conference

The inaugural conference took place at MIT on May 30-31 2019, assembling invited speakers across the disciplines of machine learning, dynamics, control systems, optimization and related disciplines. Poster sessions including many other invited researchers were also featured. With a total of 400 registered attendees, the event quickly reached the maximum that the space allowed and registration had to be closed. Details of the event schedule and posters are available at the L4DC 2019 website: <https://l4dc.mit.edu/>

As part of L4DC 2019, there was a discussion about the format of the conference for future years. There was great support for turning the event into a regular conference with submitted papers for review, while recognizing that a fair number of invited speakers should be kept as the conference is so new. We also announced that the conference will be held in Berkeley CA in 2020. We took this into account as we planned L4DC2020, and in July 2019 we started planning for L4DC 2020, securing a location on the Berkeley campus (Wheeler Auditorium) suitable for 700 participants. Since August 2019 the organizing committee has been meeting on a weekly basis.

4. New this year

This year, we have formed a Program Committee consisting of 57 participants from L4DC 2019, and we invited submissions of short papers addressing the topics listed above. Members of the PC reviewed the papers, and all accepted papers were presented as posters at this conference. A selected set of 14 papers deemed particularly exceptional by the program committee were presented as 15

minute oral talks. We were fortunate to have a stellar group of invited speakers, Chelsea Finn from Stanford, Leslie Kaelbling from MIT, John Lygeros from ETH, Karen Willcox from UT Austin, and Catherine Wolfram from UC Berkeley.

Of course, we were impacted by the coronavirus pandemic of 2020 and forced to cancel our in-person event. As most conferences in a similar situation as ours, we decided to move to a virtual setting. To respect the passion and hard-work of our contributors, we tried to come up with a reasonable plan for running this conference virtually. Our main constraints were that we wanted to highlight the best contributed papers as talks, to give visibility to the wonderful set of accepted papers without burdening the authors with more work, to be inclusive to the broader community of folks interested in learning and automation, and, importantly, to not charge registration fees.

We eventually settled on the following scheme:

1. We had a Zoom room for invited and contributed speakers and moderators.
2. This Zoom was live streamed to Youtube.
3. Questions were gathered by grad student moderators who scanned the YouTube live chat and then relayed inquiries back to the speakers.
4. We tried to keep the live part under four hours per day and to provide ample breaks. We recognize how hard it is to sit in front of a live stream for much more than that.
5. Further discussion was then done on OpenReview, where we hosted all accepted papers of the conference.
6. The proceedings of the conference were subsequently archived here by Proceedings of Machine Learning Research.

Though it took a lot of work to tie all these pieces together, everything went smoothly in the end. We were able to run an engaging conference spanning 10 time zones with nearly 2000 participants.

5. The L4DC 2020 Program Committee

We would like to acknowledge the support and dedication of the L4DC program committee, without whom the conference would not have been possible.

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