



The 2017 American Control Conference, May 24–26, Seattle, WA, USA

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The Conference is Wednesday through Friday, May 24–26, 2017

The ACC will offer workshops addressing current and future topics in automatic control from experts in academia, national laboratories, and industry. The workshops at ACC 2017 will take place prior to the conference on Monday, May 22 and Tuesday, May 23, 2017 at the conference venue (the Sheraton Seattle Hotel). Room locations for the workshops are listed below. The registration desk for the workshops is the same as the registration desk for the conference. Please note that workshops are subject to (a) cancellation due to lack of registrants and (b) capacity limits.

Conference registrants can sign up for workshops directly through the [registration site](#). For additional information about Workshops, please contact Workshops Chair, Jerry Lynch (jerlynch@umich.edu).

Workshop Schedule

Monday and Tuesday, May 22 and 23, 2017

2-day workshops (8:30am - 4:00pm / 8:00am-5:00pm)

Model Predictive Control Workshop
 Organizers: Thomas A. Badgwell, Exxon Mobil, and James Rawlings, University of Wisconsin
 Location: Willow B

Control of Complex Systems: An Integrated Perspective on Modern Power Systems
 Organizer: Krishnamurthy Dvijotham, Pacific Northwest National Laboratory, and Draguna Vrabie, Pacific Northwest National Laboratory
 Location: Willow A

Tuesday, May 23, 2017

Full-day workshops (8:00am - 6:00pm)

Nonlinear Optimization: Techniques for Engineering
 Organizer: Russell Rhinehart, Oklahoma State University
 Location: Ballard

Modeling and Intelligent Control Methods for Human-Robot Interaction
 Organizer: Yue Wang, Clemson University, and Fumin Zhang, Georgia Institute of Technology
 Location: Cedar

Methods for Stability Analysis of Haptic Teleoperation Systems
 Organizers: Mahdi Tavakoli, University of Alberta, and Ilia G. Polushin, Western University
 Location: Aspen

[PaperPlaza Conference Submission Site](#)

[Conference Registration Site](#)

[Hotel Reservation Site](#)

Key Dates

Draft Manuscripts:
~~Monday, September 19, 2016~~

Best Student Paper Nominations:
~~Friday, September 30, 2016~~

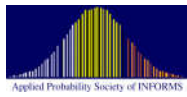
Workshop Proposals:
~~Monday, October 10, 2016~~

Acceptance/Rejection Notice:
~~Sunday, January 22, 2017~~

Final Manuscript Submission:
~~Tuesday, February 28, 2017~~

Gold Sponsors





Ensemble Control: Theory and Applications

Organizer: Jr-Shin Li, Washington University in St. Louis, Shen Zeng, University of Stuttgart, and Frank Allgöwer, University of Stuttgart

Location: Capitol Hill

Half-day workshops (8:30am - 12:30pm)

Control Engineering in Julia: Modelling, Control Design and Optimization

Organizers: Cristian R. Rojas, KTH Royal Institute of Technology, Madeleine Udell, Stanford University, and Mikael Johansson, KTH Royal Institute of Technology

Location: Redwood

Half-day workshops (1:30pm - 5:30pm)

COACHing Strong Academics in the Art of Strategic Persuasion

Organizers: Verica Radisavljevic-Gajic, Villanova University, Nancy Houfek, Harvard University, and Warren Lee, Harvard University

Location: Redwood

Workshop Descriptions

Model Predictive Control Workshop

Organizers: Thomas A. Badgwell, Exxon Mobil, and James Rawlings, University of Wisconsin

Model predictive control (MPC) has become the most popular advanced control method in use today. Its main attractive features are (i) optimization of a model forecast over the available actuators (ii) estimation of the state of the system and disturbances from the process measurements, (iii) accounting for the process and actuator constraints, and (iv) accounting for full multivariable interactions. After its introduction in the process industries in the 1970s, MPC has today become a pervasive control technology in many industries, and is now being increasingly deployed for optimization of high-level functions such as minimizing energy consumption and maximizing product quality. This two-day workshop is intended to introduce graduate students and practitioners to the theory and design of MPC systems. Simulation examples are implemented in a high-quality open source software environment (python, octave, casADI). Students are expected to bring their own laptop computers and to download and install the workshop courseware prior to the class. Topics covered include regulation, state estimation, disturbance models and offset-free control, nonlinear MPC, nonlinear moving horizon estimation, economic MPC, suboptimal MPC, and MPC with discrete actuators.

Additional Information:

jbrwww.che.wisc.edu/home/jbrow/acc2017_mpc_workshop.pdf

Methods for Stability Analysis of Haptic Teleoperation Systems

Organizers: Mahdi Tavakoli, University of Alberta, and Ilia G. Polushin, Western University

Stability analysis of bilateral and multilateral teleoperation systems, particularly in the presence of communication delays, has become a topic of intensive research interest over the last decade. As of today, a number of fundamentally different approaches has been developed to address the haptic teleoperation system stability problem in different settings and from different points of view. The specific results achieved within these approaches are very diverse, and relationships between these results are often not clear. The goal of this workshop is to bring together researchers working in the area, and to create an environment for exchange of ideas towards development of a more unified and comprehensive theory of stability of teleoperation systems. The workshop will include tutorial presentations on different approaches to stability analysis and



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Contacts for Sponsors:

Junmin Wang
wang.1381@osu.edu
(Vice Chair for Industry Activities)

Stefano Di Cairano
dicairano@ieee.org
(Exhibits Chair)

Jing Sun
jingsun@umich.edu
(General Chair)

control design for stability of teleoperation systems given by leading researchers in this area. The workshop will also feature poster presentations related to its topic.

Workshop Website: <https://goo.gl/nieUTz>

Nonlinear Optimization: Techniques for Engineering

Organizer: Russell Rhinehart, Oklahoma State University

Optimization is a fundamental tool for modeling, control, forecasting, design, safety, sustainability, etc. We desire an efficient procedure to find the best solution with minimal computational or experimental effort. This workshop is intended to be a practical guide of best practices from conventional methods. Examples will illustrate the choices and techniques. Supporting theory will be addressed, but the take-away will be the ability to implement optimization – to specify objective functions, include constraints, select an appropriate optimizer, and specify initialization and convergence criteria. The course will cover common gradient-based optimization techniques (Newton, Levenberg-Marquardt), surrogate model (successive quadratic), and direct-search techniques (Heuristic, Particle Swarm, and Leapfrogging), representing the fundamentals of most approaches. Illustrative examples and exercises will include dynamic modeling and constrained control. Mostly, examples represent mechanical situations, so that people from all engineering and computer science disciplines can understand. Participants will receive a draft textbook (Wiley, anticipated late 2017) and software in Excel VBA, which will provide exercises and access to code. Some course material can be previewed on www.r3eda.com. Participants are invited to bring a computer with Excel version 2010 or higher for in-class exploration. The programs are written by the workshop presenter, and can accommodate up to 20 decision variables. Participants are free to use the software subsequently, or to migrate it to their preferred language.

Modeling and Intelligent Control Methods for Human-Robot Interaction

Organizer: Yue Wang, Clemson University, and Fumin Zhang, Georgia Institute of Technology

An increasing number of control researchers have been putting efforts in human-robot interaction (HRI). This attention on new intelligent control methods for HRI is motivated by the benefit of synergizing human intelligence with collaborative robots to improve the joint human-robot system performance and reduce manpower and workload. There is a significant number of civilian and military applications where autonomous robots, endowed with communication, sensing and actuation capabilities perform tasks with a human-in-the-loop, to achieve a desired global goal. However, the model, analysis, and implementation of effective HRI remain largely an open problem. There is a great demand for verifiable, reliable, and scalable algorithms to serve HRI systems, where the control systems theory and engineering can contribute significantly. The workshop aims to present new developments in the modeling and control of human-robot interaction (HRI), especially methods that enable the collaboration between humans and robotic systems. This is an interdisciplinary research area across the controls, robotics, and human factors communities. We wish to identify the key challenges of robot control with a human-in-the-loop, to explore the degree to which core elements of control theory contribute to HRI, and to anticipate the future innovation in bringing human and autonomous robotic systems together. This workshop aims at promoting a discussion to identify and define the overarching ideas that can tie together different research directions in control theory and HRI. The workshop encourages the participation of young researchers in controls, robotics, and human factors, and promote the discussion between the speakers and the audience.

Workshop Website: http://yue6.people.clemson.edu/ACC17_HRI/index.php

Ensemble Control: Theory and Applications

Organizer: Jr-Shin Li, Washington University in St. Louis, Shen Zeng, University of Stuttgart, and Frank Allgöwer, University of Stuttgart

Natural and engineered systems that consist of ensembles of isolated or interacting dynamical components exhibit levels of complexity that are beyond human comprehension. These complex systems often require an appropriate excitation, an optimal hierarchical organization, or a periodic dynamical structure, such as synchrony, to function as desired or operate optimally. In many applications, the

dynamics of such ensemble systems can be regulated by the application of a single or sparsely distributed external inputs in order to alter their state configurations or dynamic structures; for example, the application of electromagnetic fields to excite quantum ensembles, the modulation of light protocol to adjust clocks of a population of circadian cells, and invasive and noninvasive neuro-stimulation for the treatment of neurological disorders. This control paradigm gives rise to challenging problems regarding robust control of under-actuated ensembles. At the other side of the spectrum, there has also been great interest in state and parameter estimation problems for populations. In many applications, such as in cell biology or quantum systems, a frequently met task is to extract information about the exact distribution of the ensemble from distributional or snapshot data. This problem of ensemble observability also forms a key concept of a coherent theory of ensembles of dynamical systems. In this workshop, we will offer a survey of emerging techniques and research problems in the field of Ensemble Control. Emphasis will be placed on both recent theoretical developments and emerging applications at the interface between systems science and control engineering, physics, neuroscience, and biology.

Workshop Website:

https://www.ece.wustl.edu/~jsli/AMLab/ACC_2017_Workshop.html

Control Engineering in Julia: Modelling, Control Design and Optimization

Organizers: Cristian R. Rojas, KTH Royal Institute of Technology, Madeleine Udell, Stanford University, and Mikael Johansson, KTH Royal Institute of Technology

Julia is a new high-level, high-performance, free and open-source programming language for scientific computing, with syntax familiar to control engineers from other technical computing environments. Julia's features make it uniquely attractive for the control and optimization communities. These features include: 1) a sophisticated compiler with performance comparable to C; 2) distributed parallel execution; 3) an extensive mathematical function library; 4) support interfaces appealing for educational purposes, like a powerful browser-based graphical notebook interface (Julia), and a network-based environment which does not require any local installation (JuliaBox). Over the last years, several Julia packages have been developed to complement the work of control engineers. These include several toolboxes for convex and nonconvex optimization, automatic differentiation, simulation of ordinary differential equations, statistics, machine learning, data-driven modeling, and control. The purpose of this workshop is to showcase the Julia language and several of its control and optimization-related packages to those who work in control theory, education and applications. Many of the talks will be hands-on demos. These will provide the audience with a real, interactive Julia experience. We aim to show that Julia is a powerful and solid alternative to commercial software for research, industrial applications, and education.

Workshop Website: <http://people.kth.se/~crrro/workshop.html>

COACHing Strong Academics in the Art of Strategic Persuasion

Organizers: Women in Control (WiC), COACH, Verica Radisavljevic-Gajic, Villanova University, Nancy Houfek, Harvard University, and Warren Lee, Harvard University

This workshop is an initiative of the "Women in Control" (WiC) and COACH programs. The purpose of this workshop is mentoring the new generation of female scientists with the focus on negotiation and communication skills, which are important platforms for successful carrier. This workshop is designed to provide powerful women with skills to succeed in accomplishing their goals in negotiations and meetings. Participants will be introduced to performance techniques that people in the theater and in leadership training understand about how to be effective (body language and non-verbals). They will learn how to articulate a clear purpose, land their message, be heard, enhance personal presence, depersonalize attacks, and manage hot moments. Discussion, coaching, and role-play, taken from the group, creates a highly interactive, personal and powerful learning of the wide range of tactics available for success.

[Link to Workshop Description](#)

Control of Complex Systems: An Integrated Perspective on Modern Power Systems

**Organizer: Krishnamurthy Dvijotham, Pacific Northwest National Laboratory,
and Draguna Vrable, Pacific Northwest National Laboratory**

The Control of Complex Systems Workshop brings together leading researchers in the control community, U.S. Department of Energy stakeholders, grid regulators, utility engineers, building scientists, and building controls and equipment vendors to discuss the technical obstacles and potential solutions to unlock the true potential of next generation power grids. This workshop is the third in the series, and first to be held as an ACC workshop. It emphasizes the interactions between the following technical areas as they relate to modernization of the electric power grid: 1) Dynamics and Control, 2) Analytics and Optimization, 3) Economics and Market Design. The workshop connects the research community with the real-world problems and specific technical challenges on the power grid transformation pathway towards highly integrated, maximally efficient, reliable, and secure operation. Control and decision-making applications relevant to all aspects of power grid operation are within scope, ranging from the bulk power system down to end point resources such as distributed renewable generation, energy storage systems, and residential and commercial buildings. The workshop is accessible by a broad controls audience, and it starts with tutorial sessions on the three technical areas. The tutorials will be particularly useful for beginning graduate students interested in working in the area of control for power systems. It then features both industry and academic research presentations discussing challenges and opportunities for applying advanced controls, analytics, and optimization to future power grids. The talks will provide a balance of theoretical and applied research.

Workshop Website: http://events.pnnl.gov/default.aspx?topic=Control_of_Complex_Systems:_An_Integrated_Perspective_on_Modern_Power_Grid_Control