
WELCOME TO THE ACC2018

THE AMERICAN AUTOMATIC CONTROL COUNCIL

The American Control Conference is organized under the auspices of the American Automatic Control Council (AACC), which is an association of nine professional societies:

- American Institute of Aeronautics and Astronautics (AIAA)
- American Institute of Chemical Engineers (AIChE)
- American Society of Civil Engineers (ASCE)
- American Society of Mechanical Engineers (ASME)
- Institute of Electrical and Electronics Engineers (IEEE)
- Institute for Operations Research and the Management Sciences Applied Probability Society (INFORMS APS)
- International Society of Automation (ISA)
- Society for Industrial and Applied Mathematics (SIAM)
- Society for Modeling and Simulation International (SCS)

AACC represents the United States to the global control community and supports the mission of the individual member societies in enhancing the role and contributions of automation for the benefit of humankind. AACC is also the US National Member Organization (NMO) of the International Federation of Automatic Control (IFAC), a multinational federation of NMOs, each representing the engineering and scientific societies concerned with automatic control in its country. AACC helps arrange for IFAC events in the U.S. and provides delegates for IFAC committees and leadership.

Organizing the annual, 3-day, cross-disciplinary ACC is the principal technical activity of AACC. The conference typically attracts about 1,300 participants and features about 1,000 refereed papers. The ACC is an internationally recognized control conference with substantial participation from outside the US. Academe, industry, and government are all well-represented. Additionally, the AACC offers several annual awards to recognize and honor individuals who have made substantial contributions to control theory and practice. These awards are presented during the AACC Awards Ceremony, held at the ACC. AACC also supports control education from K-12 through post-graduate studies. The AACC provides opportunities for personal and professional development and recognition to its large cast of volunteers, on whom it is crucially dependent for its operations and success.

The activities of the AACC are governed by a Board of Directors. Each AACC member society appoints a director. Operational responsibilities for the AACC rest with five officers, who report to the Board. Operating committees for ACCs, awards committees, etc., report to the officers. All directors, officers, and committee members are volunteers.

To learn more about AACC please visit www.a2c2.org.

GREETINGS FROM THE AACC PRESIDENT

On behalf of the American Automatic Control Council (AACC), I am pleased to welcome you to the 2018 American Control Conference (ACC) in Milwaukee. ACC attracts participants from academia, industry, and governments from around the world in a wide range of disciplines including all of engineering and control-relevant branches of applied mathematics.

AACC is a federation of nine professional societies, which are the American Institute of Aeronautics and Astronautics (AIAA), American Institute of Chemical Engineers (AIChE), American Society of Civil Engineers (ASCE), American Society of Mechanical Engineers (ASME), Institute of Electrical and Electronics Engineers (IEEE), the International Society for Automation (ISA), the Society for Modeling & Simulation International (SCS), the Society for Industrial and Applied Mathematics (SIAM), and Applied Probability Society as a subdivision of the Institute for Operations Research and the Management Sciences (INFORMS APS). The mission of the AACC is to promote cooperation among the various segments of the automatic control profession within the U.S., and to represent the U.S. in international activities. To this end, AACC manages the ACCs, supports control-related workshops and symposia, represents the U.S. in the International Federation of Automatic Control (IFAC), provides volunteers for IFAC activities, and undertakes other initiatives that promote and coordinate developments in the automatic control field.

AACC was founded just more than sixty years ago in 1957 and had its first organizational meeting in that year in Chicago, which is only about an hour south of Milwaukee. Since its founding, AACC has been an organization run by volunteers. Among the activities of the AACC, the largest single activity is the organization of the ACCs. The American Control Conference has had two name changes in its history. The first conference – the National Automatic Control Conference – was held in 1959 in Dallas. The very next year the conference was renamed the Joint Automatic Control Conference, which ran until 1981. The AACC decided to change the conference name to the American Control Conference during an operational change in which the conference went from being organized each year by one of its member societies (which would rotate among the societies) to being organized by an operating committee whose members are drawn from multiple societies. Each operating committee is led by a General Chair and a Program Chair, and these positions as well as the operating committee members change each year.

The governing body of the AACC is its Board of Directors, whose members are selected by the member societies. The Board provides overall governance of the federation and elects the Chairs of various committees, the ACC General and Program Chairs, and the Officers who are responsible for operations and recommendations to the Board.

In addition to being a technical meeting, each ACC is also a celebration of automatic control. In addition to the peer-reviewed papers in the conference proceedings, ACC features workshops, special sessions, exhibits, and social events which include a banquet, opening and closing receptions, and the annual AACC Awards Ceremony. The planning for an ACC starts about five years in advance, and I thank the General Chair Jordan Berg, the operating and program committees, the AACC Board and Officers, and many others for their contributions. My best wishes to all conference participants for a stimulating and productive ACC in Milwaukee!

Richard D. Braatz
AACC President, 2018-2019

GREETINGS AND THANKS FROM THE GENERAL CHAIR

On behalf of the Operating Committee, it is my great pleasure to welcome you to the 2018 American Control Conference. The success of any conference depends first and foremost on its participants—we thank you sincerely for choosing ACC as a forum for disseminating your work, and we are grateful for your companionship in Milwaukee, as part of a vital community of colleagues and friends.

This is the first ACC to be held in Milwaukee, and there is a lot for a first-time visitor to discover. Milwaukee is a vibrant modern city with a rich history. Some of the contrasts that distinguish Milwaukee can be seen in our two conference venues; the ornate Milwaukee Hilton City Center Hotel is a lovingly restored art deco masterpiece, while the spacious, bright, and open Wisconsin Center reflects a thoroughly modern sensibility. Different as they are in appearance, these buildings share a timeless elegance, and are physically linked by a short skywalk. Conference events will be split between the Hilton and the Wisconsin Center. The pre-conference workshops, the Tuesday night welcome reception, and most of the society meetings will be held at the Hilton. The plenary talks, the Thursday lunch banquet, the technical tracks, and the exhibits will be held at the Wisconsin Center. This year we have added an evening plenary/public lecture on the first night of the conference. The farewell reception will be held Friday evening in the stunning Calatrava-designed Milwaukee Art Museum. Conference-goers may enjoy walking between the hotel and the museum—a straight trip of just over a mile on Wisconsin Avenue.

Beyond ACC events, Milwaukee offers restaurants, museums, and outdoor activities. Lake Michigan and the Milwaukee River provide invigorating scenery and abundant recreational opportunities. Settled by German immigrants, Milwaukee became famous for its breweries. Today, local microbreweries offer tours and samples, while the German influence can still be seen in the city's traditional foods. The historic Third Ward neighborhood, about a mile from the hotel, is home to restaurants, cafes, galleries, and clubs.

Every ACC General Chair benefits enormously from the large community of dedicated volunteers that support AACC activities, including but not limited to the conference OpComm. Chief among these was Program Chair, Zongli Lin, whose expertise, experience, and energy shaped and enabled the conference. AACC officers Linda Bushnell, Wayne Bequette, Jay Farrell, Richard Braatz, and Glenn Masada provided their usual support in unusually large quantities. Doug Lawrence was kind enough to help out a year in advance of his own conference, while Jing Sun was kind enough to share experiences a year after hers. Alessandro Astolfi and Amir Aghdam were absolutely dependable and utterly indispensable. Pradeep Misra continues to set the standard in responsiveness and wise counsel. Finally, I cannot express how grateful I am for the role played by Bob Judd. Bob was there to walk me through my first and most formative task—choosing the conference venue and negotiating the contract. Without his guidance I would have been completely overwhelmed.

There is no way to thank everyone that made this event possible. I hope that the conference itself may serve as partial thanks, and a source of satisfaction. Organizing this conference was a great experience for me. I have never worked with a finer group of people. I hope I may be lucky enough to work with them again.

Jordan M. Berg

General Chair, 2018 American Control Conference

TECHNICAL PROGRAM OVERVIEW

Welcome to the 2018 American Control Conference! We have assembled a strong and diverse technical program containing sessions on both theoretical advances and innovative applications. Sessions on theoretical advances cover topics on adaptive control, cooperative control, estimation and identification, iterative learning control, network analysis, nonlinear systems, and many others. Application sessions are on automotive control, biomedical systems, building and facility automation, energy systems, mechatronics, robotics, smart grids, system biology, and many other topics. The main conference days, Wednesday to Friday, will start with a plenary section, followed by parallel tutorial, invited and contributed sessions. There will be a public plenary speech on Wednesday evening.

The 2018 ACC received 1623 paper submissions, 48 invited session proposals, 7 tutorial session proposals, and 14 pre-conference workshop proposals. The Program Committee worked diligently to select 1087 papers that will be presented in 22 parallel sessions at the conference. The paper acceptance rate was just below 67%. I am grateful to the Program Committee members, the Society Review Chairs, and the Associate Editors for efficiently handling the entire set of submitted papers.

I was fortunate to be working with the team of dedicated and experienced colleagues, for which I would like to thank the General Chair Jordan Berg for offering me the Program Chair responsibility and for putting such a great team together. As always, it has been a great pleasure working with Jordan. I would like to thank Juergen Hahn, Vice Chair for Invited Sessions, for diligently handling reviews of all invited papers and invited session proposals. Sahika Genc, Workshops Chair, actively sought and selected an outstanding group of pre-conference workshops. Ken Butts, Vice Chair for Industry & Applications, solicited and coordinated a thorough review process for the tutorial proposals and papers. Nejat Olgac, Vice Chair for Special Sessions, actively solicited and coordinated the many logistics associated with the special sessions. Alex Leonessa, Vice Chair for Student Affairs, coordinated the selection of five Student Best Paper Competition finalists from the 57 nominations. Atul Kelkar, Publicity Chair, not only redesigned the ACC conference website, but also kept it updated throughout the submission process. Both Donald Chmielewski, Local Arrangements Chair, and Shreyas Sundaram, Exhibits Chair, traveled to the conference venue and provided me with insightful suggestions for the optimal use of the space in the conference center. Xiang Chen, Registration Chair, worked diligently and skillfully to address all the issues that have come up during the final submission process. Finally, the importance of Jingang Yi, Finance Chair, goes without saying.

In January, I invited a small group of colleagues to come to the grounds of University of Virginia, where we spent the day to assemble the technical program. They are Amir Aghdam, Alessandro Astolfi, Jordan Berg, Juergen Hahn, and Douglas Lawrence. I would like to thank my graduate students, Syed Ali Asad Rizvi, Yusheng Wei and Yijing Xie, who stood by throughout the day to provide assistance as we needed.

The program could not have come together without Alessandro Astolfi, a guru of both PaperPlaza and our research field! Alessandro was available to guide each detail in the process of paper reviewing and program assembling. Many authors have expressed their gratitude for his warmhearted help with special requests. Finally, I am indebted to the numerous reviewers who carried out the majority of the work in the review process. I would also like to thank all authors and other attendees of the conference. Enjoy the conference!

Zongli Lin

Program Chair, 2018 American Control Conference

GREETINGS FROM THE IFAC PRESIDENT

It is my great pleasure as president of the International Federation of Automatic Control (IFAC) to welcome you to the American Control Conference organized by the American Automatic Control Council (AACC) and co-sponsored by IFAC.

The tight connection between AACC and IFAC does not only stem from the co-sponsorship of the American Control Conference. AACC is the U.S. national member organization (NMO) of IFAC and thus represents the interests of US researchers in the fields of systems and control within the IFAC organization. I want to take the opportunity to thank AACC for the excellent and fruitful collaboration over many years, and for their contribution and continued support of IFAC in furthering its aims and objectives and hence to contribute to the automatic control community at large.

The primary objective of IFAC is to serve all those concerned with the theory and application of automatic control and systems engineering, wherever they are situated. Furthering this objective includes organizing and sponsoring more than 50 technical meetings every year, the publication of eight prestigious archival journals, recognizing great achievements and talent through IFAC Awards, promoting the benefits of automatic control among the public at large and many more initiatives that are carried out thanks to all the IFAC boards, committees and individuals. In fact, IFAC's greatest strength is its people and the volunteers who devote so much of their time to the benefit of us all. Many of the IFAC volunteers will be present at ACC 2018 and it is never one time too often to thank them for their dedicated efforts and their great work.

I also want to take the opportunity to invite all attendees of ACC 2018 to participate as an individual in IFAC. A good starting point is to become an IFAC affiliate and subscribe to the IFAC newsletter on the IFAC webpage at www.ifac-control.org. Read about top-notch research and publish your own results in our high-quality journals. Be a part of IFAC and join us in promoting automatic control facing the challenges of tomorrow.

Finally, I want to thank the organizers of the American Control Conference: Looking at the program, the Milwaukee ACC is once again a meeting of high scientific level, bringing together junior and senior colleagues from all over the world. And, ACC 2018 is again organized in an admirably professional way. In this setting, where the newest research findings in the broad field of systems and control are presented and exchanged, new ideas and new collaborations can originate and flourish.

Last but not least, I wish us all interesting days and an exciting time in beautiful Milwaukee, which is called "Brew City". Coming from Germany myself – which could be called "brew country" – this claim will most certainly be subject to an extensive inspection. I am looking forward to meeting many of the ACC participants during the scientific sessions – and in the pubs of Milwaukee.

Frank Allgöwer

President of the International Federation of Automatic Control