

ACC 2016 Workshop Proposal

Collaborative Sensing, Learning, and Control in Human-Machine Systems

Workshop Organizers:

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Luca Bertuccelli (United Technologies Research Center)

Goals of the workshop:

Recent research at the juncture of decision and learning theory are leading to fundamentally new ways of understanding and tackling challenges in sensing, estimation and control problems. This is especially true for human-machine systems, where autonomous machines can efficiently exploit human insights, knowledge and information-gathering capabilities to improve robustness and performance in complex, time- and safety-critical situations. To enable seamless human-machine collaboration, the community is striving to solve fundamental questions such as asking human the right question(s) at the right time in the right form and vice-versa; understanding each other's (human and machine) perspective; fusing soft, imperfect information with hard, sensory data; and adapting to complex and possibly unforeseen environment and situations.

In this context, this workshop aims to bring together experts in the fields of control theory, machine learning, artificial intelligence, and human-machine systems to discuss the fundamentals, state of the art and open questions for the various related topic areas including but are not limited to: value of information and optimization/learning strategies for collaboration; Bayesian and non-Bayesian techniques for modeling and adaptation; modeling and explorative/exploitative learning of human capabilities; human-machine communication; team planning and control; interaction in multi human/multi-machine systems; applications to robotics, decision support systems, cyber-physical systems, and socially important domains such as transportation, energy, medicine, manufacturing, and beyond.

Intended audience:

Researchers from academia, industry and government who are in general interested in human-machine systems, collaborative planning and active learning, machine learning for controls, multi-agent systems and robotics would be the target audience for this workshop. The workshop will host several renowned experts in the field with a wide variety of perspectives (academia, industry and government) as speakers and they will discuss fundamental developments as well as open problems in this area. Therefore, it will be also an ideal opportunity for young researchers, postdoctoral fellows and graduate students who are already working or intend to work in these areas to learn, discuss and share their thoughts. The panel discussion will be an exciting opportunity for both experts and new researchers to identify the key challenges and finally, a few talks on certain emerging concepts will help the community get a glimpse into the future course of this important research topic.

Workshop plan/outline:

Our workshop will consist of:

- At least two speakers each from academia, government, and industry bringing in a diverse perspective of this area of Human-Machine system
- A panel discussion to identify key technical challenges of this area and how the Decision and Controls community can contribute
- A few short presentations providing emerging views of the field

Tentative format:

Topic	Subtopic	Time	Speaker name	Title
Introduction		0900-0915		
A view from academia				
	Subtopic 1	0915-1000		
	Subtopic 2	1000-1045		
Coffee break		1045-1100		
A view from the government				
	Subtopic 1	1100-1145		
	Subtopic 2	1145-1230		
Lunch		1230-1330		
A view from industry				
	Subtopic 1	1330-1400		
	Subtopic 2	1400-1430		
Panel discussion				
	Industry + govt + academia	1430-1530		
Coffee Break		1530-1550		
On the horizons (junior faculty)	Subtopic 1	1550-1620		
	Subtopic 2	1620-1650		
	Subtopic 3	1650-1720		

Possible speakers and potential topics for presentation:

Confirmed:

Nicholas Roy (Associate Professor, MIT): learning for human-robot communication for probabilistic planning and perception [*view from academia*]

Missy Cummings (Associate Professor, Duke): human factors in machine teaming and modeling [*view from academia*]

Erin Solovey (Assistant Professor, Drexel): emerging technology and techniques for human-machine: (brain-computer interfaces, physiological and wearable computing, etc.) [*on the horizon*]

J.W. Curtis (Senior Research Engineer, Air Force Research Laboratory): defense applications for risk-aware human-machine collaboration [*view from government*]

Luca Bertucelli (United Technologies Research Center): industry applications of learning-based human-machine interaction [*view from industry*]

Invited:

Julie Shah (MIT): learning-based scheduling, planning and task allocation in human-machine teams [*on the horizon*]

Sameera Ponda (Google Project Loon): industry opportunities for human-machine collaboration [*view from industry*]

Sergey Levine (University of British Columbia): deep learning for policy-based control and planning [*on the horizon*]

David Corman (National Science Foundation): opportunities for research in cyberphysical systems [*view from government*]

Other potential speakers (including possible backups):

Marc Steinberg (Office of Naval Research) – human-machine collaboration and the science of autonomy [*view from government*]

Stefanie Tellex (Brown University) – learning-based natural language processing for human-robot interaction [*on the horizon*]

Dan Roy (University of Toronto) – statistical machine learning using probabilistic programming [*on the horizon*]

Stu Young (Army Research Laboratory) – learning and human-machine collaboration for tactical robotics applications [*view from government*]

Mark Campbell (Cornell University) – machine learning for human-autonomy interaction in autonomous driving [*view from academia*]