**Title of the invited session**

Distributed Adaptive Dynamic Programming and Reinforcement Learning for Large-Scale Systems

**Justification**

Adaptive Dynamic Programming (ADP) and Reinforcement Learning (RL) approaches have been proved to be very powerful for optimization and control in complex dynamic environments, such as the process industry, the intelligent power grids, the traffic and communication networks, the cooperative adaptive cruise control systems. In recent years, novel distributed adaptive dynamic programming and reinforcement learning approaches and frameworks including game-based RL, biologically inspired ADP, deep RL and so on, have been proposed and widely applied in large-scale systems such as multi-machine power systems, smart power grid and sustainable energy systems, cooperative adaptive cruise control vehicles and so on. One direction in the distributed ADP and RL research is to combine the data-driven approaches with the multi-agent system techniques to relax the impractical requirement about actual knowledge of system dynamics.

As a novel ADP and RL approach, many open issues and challenges still need to be studied and discussed for the distributed ADP and RL for large-scale systems. This special session will enhance the discussion among different societies to explore more challenging cross-disciplinary topics along this direction. Specific topics of interest include but are not limited to:

* + Distributed ADP and RL for large-scale systems
  + Distributed ADP and RL for multi-agent systems
  + Distributed ADP and RL based event-triggered/self-triggered control
  + Robust ADP and RL for uncertain systems
  + Supplementary ADP for complex systems
  + Game-based ADP and RL for differential games
  + Deep reinforcement learning
  + Applications in power systems
  + Applications in cooperative adaptive cruise control and vehicle control systems

**Short bio of the proposers together with contact email addresses**

**Qichao Zhang** is pursuing the Ph.D. degree from the Institute of Automation, Chinese Academy of Sciences, Beijing. After graduation in 2017, he will be an assistant researcher at the Institute of Automation, Chinese Academy of Sciences, Beijing, China. His current research interests include reinforcement learning, game-based adaptive dynamic programming and optimal control.

**Yuanheng Zhu** received the Ph.D. degree in control theory and control engineering from the Institute of Automation, Chinese Academy of Sciences, Beijing, China, in 2015. He is currently an assistant researcher at the Institute of Automation, Chinese Academy of Sciences, Beijing, China. His major research interests include reinforcement learning, adaptive dynamic programming and neural networks.

**Dongbin Zhao** received the B.S., M.S., Ph.D. degrees from Harbin Institute of Technology, Harbin, China, in 1994, 1996, and 2000 respectively. He was a postdoctoral fellow at Tsinghua University, Beijing, China, from 2000 to 2002. He has been a professor at Institute of Automation, Chinese Academy of Sciences since 2002, and also a professor with the University of Chinese Academy of Sciences, China. From 2007 to 2008, he was also a visiting scholar at the University of Arizona. He has published 4 books, and over 60 international journal papers. His current research interests are in the area of computational intelligence, adaptive dynamic programming, deep reinforcement learning, robotics, intelligent transportation systems, and smart grids.

Dr. Zhao is the Associate Editor of *IEEE Transactions on Neural Networks and Learning Systems* (2012-), *IEEE Computation Intelligence Magazine* (2014-), etc. He is the Chair of Beijing Chapter, and was the Chair of *Adaptive Dynamic Programming and Reinforcement Learning Technical Committee* (2015-2016)*, Multimedia Subcommittee* (2015-2016) of IEEE Computational Intelligence Society (CIS). He works as several guest editors of renowned international journals. He is involved in organizing several international conferences.

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