Preface

Jun Chen*

Department of Electrical and Computer Engineering,
Oakland University,
Rochester, MI 48309, USA
Email: junchen@oakland.edu
*Corresponding author

Xiangyu Meng

Department of Electrical and Computer Engineering,
Louisiana State University,
Baton Rouge, LA 70803, USA
Email: xmeng5@lsu.edu

Weinan Gao

State Key Laboratory of Synthetical Automation for Process Industries,
Northeastern University,
Shenyang, Liaoning, 110819, China
Email: gaown@mail.neu.edu.cn

Biographical notes: Jun Chen received his BS in Automation from the Zhejiang University, Hangzhou China, in 2009, and PhD in Electrical Engineering with minor in Computer Science from Iowa State University, Ames, IA, USA, in 2014. He was with the Idaho National Laboratory from 2014 to 2016 as a Research Scientist, and with General Motors from 2017 to 2020 as a Senior Control Engineer. He joined the Oakland University in 2020, where he is currently an Assistant Professor in ECE Department. His research interests include AI-enhanced advanced control and optimisation, with applications in automotive and energy systems. He is currently a senior member of the IEEE and member of the SAE.

Xiangyu Meng received his PhD in Electrical and Computer Engineering from the University of Alberta, Edmonton, Alberta, Canada, in 2014. From December 2014 to December 2016, he was a Research Fellow with the School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore. From January 2017 to December 2018, he was a Postdoctoral Associate with the Division of Systems Engineering, Boston University, USA. Since 2019, he has been an Assistant Professor with the Division of Electrical and Computer Engineering, Louisiana State University, Baton Rouge, LA, USA. His research interests include intelligent control systems, reinforcement learning and their applications to intelligent transportation systems, and connected and autonomous electric vehicles.

Weinan Gao received his BSc in Automation from the Northeastern University, Shenyang, China, in 2011, MSc in Control Theory and Control Engineering from Northeastern University, Shenyang, China, in 2013, and PhD in Electrical Engineering from New York University, Brooklyn, NY, in 2017. He is currently a Professor with the State Key Laboratory of Synthetical Automation for Process Industries at Northeastern University. His research interests include reinforcement learning, adaptive dynamic programming, optimal control, cooperative adaptive cruise control, intelligent transportation systems, sampled-data control systems and output regulation theory. He is an associate editor of *IEEE Transactions on Neural Network and Learning Systems*, *IEEE/CAA Journal of Automatica Sinica*, *Control Engineering Practice*, *IEEE Transactions on Circuits and Systems II: Express Briefs and Neurocomputing*.

As guest editors, we are delighted to introduce this special issue devoted to learning-based control, which has been considered as an effective control technique for systems with unknown dynamics/disturbances. Learning-based control has been proven to be successful for both continuous-time and discrete-time systems, as well as large-scale interconnected systems. Recent development in the internet of things in various systems has opened up more opportunities for learning-based control, leading to innovations in both theoretical development and applications. The purpose of this special issue is to provide a forum for cutting-edge developments on learning-based

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control, with focus on both theory and applications. The issue consists of eight articles discussing power and energy systems, economics, fuel cells, autonomous driving, etc. The contents of the eight articles selected for this special issue are described briefly as follows.

The paper entitled 'Jaya algorithm-based optimal control for inverted pendulum' focuses on optimal control, specifically linear quadratic regulator (LQR), for highly nonlinear systems. To improve control performance, the LQR gain matrices are optimised by the Jaya algorithm. As a demonstration, the proposed method is applied to an inverted pendulum cart system and compared to a well calibrated PID controller. The paper entitled 'PI-based hybrid control for load-stress management of a fuel cell-based hybrid power system' focuses on proton exchange membrane-based hydrogen fuel cells with a PID controller to achieve the current limiting and maintain the voltage level simultaneously during the demand of the variable loads. The paper 'Experimental validation of an output feedback controller based on an integral and adaptive backstepping technique for a fuel-cell power system' proposes output feedback control strategies based on backstepping techniques for full cell power systems. A laboratory prototype is built to show the effectiveness of the proposed control approaches.

The paper 'Impacts of countermeasures on driving performance through drivers' attention in rural curves: a driving simulation study' explores the impacts of countermeasures on driving performance through attention under different weather conditions and traffic flows using an experiment with a driving simulator and an eye tracker. The paper 'A survey on modern trends of low power long range network applied on IoT applications' reviews the recent advancements and technical analysis of long range (LoRa) network, which is popular in all areas of engineering fields. Several applications of the LoRa network are also discussed. The paper 'Research on exchange rate forecast based on MLR-ELM model' focuses on economics and introduces a new model to predict the exchange rate. Specifically, a combined model of the multiple linear regression (MLR) model and the extreme learning machine (ELM) model is proposed, and the simulation results suggest the good performance of the proposed model.

Finally, the paper entitled 'Establishing a calculus learning application' suggests an innovative way of learning calculus, especially in the context of global pandemics such as COVID-19.

We hope that readers will find this special issue informative and that it can stimulate following research and breakthroughs in learning-based control to overcome the challenges introduced by the increasing amount of sensors and data. The guest editors would like to thank all the authors for submitting their manuscripts and acknowledge all the reviewers for their critical contributions in reviewing the papers.