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Distributed Coordination and Learning on Multi-Agent Systems

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This talk will provide an overview of the latest developments in distributed coordinated control and learning techniques for multi-agent systems (MAS). As an increasingly popular research area, MAS has the potential to revolutionize various industries, such as robotics, transportation, and manufacturing, by enabling a group of agents to autonomously work together to achieve complex objectives. During the presentation, we will discuss the recent advances in robust, resilient, and safe coordinated control of MAS under constraints such as uncertainties, disturbances, cyber-attacks, and dynamic environments. Additionally, we will explore how machine learning techniques, particularly reinforcement learning, have been employed to enable agents to learn and adapt in real-time, uncertain, and dynamic environments. Examples of MAS applications in multiple autonomous systems, heterogenous systems, and human-machine systems are also provided. Finally, we will touch upon some of the current challenges and future research directions in MAS, including the integration of human-agent interaction, and the development of theoretical frameworks to better understand the underlying dynamics of these complex systems.

Peng Shi received the PhD degree in Electrical Engineering from the University of Newcastle, Australia, the PhD degree in Mathematics from the University of South Australia, the Doctor of Science degree from the University of Glamorgan, UK, and the Doctor of Engineering degree from the University of Adelaide, Australia. He is now a Professor at the School of Electrical and Mechanical Engineering, and the Director of Advanced Unmanned Systems Laboratory, at the University of Adelaide, Australia. His research interests include systems and control theory and applications to autonomous and robotic systems, cyber-physical systems, and multi-agent systems. He received the Ramesh Agarwal Life-time Achievement Award in Science, Engineering and Technology from the *International Engineering and Technology Institute* in 2023, the MA Sargent Medal Award from *Engineers Australia* in 2022; the honour of Life-time Achiever Leader-Board and Field Leader from The *AUSTRALIAN Research Review* from 2019-2022, and the recognition of a Highly Cited Researcher from *Thomson Reuters* 2014-2022. Currently he serves as the Editor-in-Chief of IEEE Transactions on Cybernetics, a Senior Editor of IEEE Access, and an editorial member for a number of journals, including Automatica and IEEE Transactions on (Artificial Intelligence, and Circuits and Systems). His professional services also include as the current President of the International Academy for Systems and Cybernetic Sciences, the former Vice President of IEEE SMC Society, and IEEE SMC Distinguished Lecturer. He is a Fellow of IEEE, IET, IEAust and CAA, a Member of the Academy of Europe, and an Honorary Member of the Romanian Academy of Scientists.