

Highly-Efficient Autonomous Learning for Intelligent Robots

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Abstract

With the increasing demand for various types of robots and unmanned systems in industries such as healthcare and national defense, it is necessary to research and explore efficient autonomous learning theories and methods for intelligent perception and optimization control of robot systems in complex and uncertain environments, reducing reliance on manually labeled samples or actual interactive data. Based on the analysis of relevant technical requirements, the report introduces the research progress of regularized reinforcement learning, abstract model-based deep reinforcement learning, online learning predictive control, and transfer reinforcement learning, as well as several research advances in their application in robot grasping and intelligent vehicle optimization control. Finally, some analysis and outlook are provided for further work.



Xin Xu is currently a full Professor with the College of Intelligence Science and Technology, National University of Defense Technology. He received the National Distinguished Young Scholar Fund from National Natural Science Foundation of China. He has been a Visiting Professor with Hong Kong Polytechnic University, Hong Kong; the University of Alberta, Edmonton, AB, Canada; the University of Guelph, Guelph, ON, Canada; and the University of Strathclyde, Glasgow, U.K., respectively. He has coauthored more than 200 papers in international journals and conferences and coauthored four books. His research interests include reinforcement learning, approximate dynamic programming, machine learning, robotics, and autonomous vehicles. Dr. Xu received the National Excellent Youth Science Foundation of China in 2018, the Fork Ying Tong Youth Teacher Fund of China in 2008 and the Second Class National Natural Science Award of China in 2012. He is also one of the recipients of two 1st-class Natural Science Award of Hunan Province. He is an Associate Editor of IEEE Transactions on Systems, Man, and Cybernetics: Systems, IEEE Transactions on Intelligent Vehicles, Information Sciences, International Journal of Robotics and Automation, etc.