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Learning enabled intelligent robot new era

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Learning provides a useful tool for the automatic design of autonomous robots. “We're going to see robots play a significant role in society. They will be servants, companions, helpers, and everything in between.” (Colin Angle). Self-improving robots would relieve humans from much of the drudgery of programming and would potentially allow their operation in environments that were changeable or only partially known. If we view the ultimate goal of Artificial Intelligence as bringing to reality systems such the R2D2 robot (from the movie *Star Wars*), then it is clear that we must study fundamental capabilities, such as learning, in the context of real robots or sufficiently realistic simulated ones. Although we may not reach our ultimate destination for some time to come, there are many intermediate goals along the way which will offer ample reward in terms of useful practical systems and scientific insights. “Robots can remove workers from dangerous and boring jobs. Not only will they not take away human jobs, but they will make human work more meaningful and lead better lives.” (Joseph F·Engelberger, known as the father of robots)

Research in this domain is spurred by the increasing integration of robots into human daily life. Robots possess the capability to acquire knowledge that may be challenging for humans, including intricate programming skills, unfamiliar information, and changing environments. Leveraging learning-based approaches has the potential to significantly decrease development time and costs associated with deploying robots for specific tasks, offering a more efficient alternative to traditional, handcrafted programming methods. The overarching objective is to implement robots in real-world scenarios, and the impetus behind research in robot learning stems from its practical applications in diverse sectors such as healthcare, manufacturing, agriculture, and disaster response. Seamless interaction between robots and humans necessitates a deep understanding of human behavior, prompting research in robot learning to concentrate on augmenting the social and cognitive capabilities of robots for improved interaction in various contexts. Presently, numerous journals dedicated to robotics are emerging, reflecting the growing significance of robot learning across diverse fields in recent years.

Robot Learning is a field of research at the intersection of machine learning and robotics, delving into techniques that empower a robot to assimilate new skills or adeptly adjust to its surroundings using advanced learning algorithms. These algorithms are designed to target an array of skills, encompassing sensorimotor capabilities such as locomotion, grasping, and active object categorization. Furthermore, they extend to interactive proficiencies, including collaborative object manipulation with a human peer, and linguistic aptitudes such as interpreting the grounded and situated meaning embedded in human language. Learning in this context transpires through either autonomous self-exploration or under the guidance of a human instructor, as exemplified in robot learning by imitation. The realm of robot learning is intricately connected to adaptive control, reinforcement learning, and developmental robotics. The latter focuses on the challenge of autonomous, lifelong acquisition of diverse skill sets, fostering a comprehensive understanding of the intricacies involved in robotic learning processes.

Robot Learning is intended to be a cross-disciplinary journal aimed at enabling robots to learn and continuously improve their performance and behavior by acquiring and utilizing data, experience, and information from the environment. The journal will publish original research on principles and theories, explaining how to enable robots to adapt to different environments, tasks, and working conditions, thereby enhancing their flexibility, autonomy, and adaptability. It aims to help us understand the learning process, design, implement, and assess systems. Progress towards this goal would also make fundamental contributions to artificial intelligence by furthering our understanding of how to successfully integrate disparate abilities such as perception, planning, learning, and action.

The development of robot learning has become a general trend today. Early mechanical devices and automated equipment can be traced back to ancient civilizations. For example, the ancient Greek engineer Archimedes designed a number of mechanical devices for specific tasks. Similar automatons existed in some cultures in ancient China and the medieval period. The Industrial Revolution in the 18th and 19th centuries promoted the development of mechanical technology. Various automated machines emerged during this period, although they differed from modern robots. Robotics has gradually evolved into an interdisciplinary field, covering many fields such as mechanical engineering, computer science, and electrical engineering. The research focus extends to the robot's perception, decision-making and execution capabilities. Robot research is still developing and involves more and more application fields, such as medical care, service industry, agriculture, *etc.* To be successful as a field, robot learning must bring new ideas and technology, but not recapitulate the common confusions and missteps that other fields spent considerable effort to overcome.

Several features of the journal reinforce my interdisciplinary perspective on the field. The editorial board draws from a wide range of scientific expertise and authors that submit to the journal can expect to be tested on their interdisciplinary knowledge. Papers will often be reviewed by reviewers with different disciplinary perspectives. In the current era marked by the rapid advancement of robotics and artificial intelligence, We've come to recognize the paramount importance of disseminating knowledge in this domain. The initiation of a dedicated journal on this subject represents a significant milestone, unmistakably signaling

that robotic learning has evolved into a pivotal scientific field crucial for the future development of humanity. Such an accomplishment is a testament to the considerable personal efforts invested in this venture. This journal now stands as a pivotal platform for fostering academic exchanges, providing a space where scholars from diverse backgrounds can converge to explore and contribute to the burgeoning field of robot learning. It is our sincere hope that the journal will serve as a catalyst, inspiring more scholars to delve into the multifaceted realms of robotic learning, thereby shaping the future trajectory of this crucial scientific discipline.

Acknowledgments

The establishment of this journal would not have been conceivable without the tremendous support from the Advisory Board and the dedicated efforts of numerous colleagues who diligently paved the way for the creation of this new platform. Our heartfelt gratitude extends to everyone involved in this process, and we consider ourselves exceptionally fortunate to collaborate with such a talented team as the inaugural Editors-in-Chief. We would also like to express our sincere appreciation to the committed and diverse members of the Editorial Board. Their tireless efforts in identifying high-quality reviewers, ensuring prompt and thoughtful decisions, and providing constructive feedback to authors have been invaluable. Additionally, we extend my deepest thanks to the authors who have placed their trust in this fledgling journal. Their unwavering support and continuous contributions, combined with the dedication of our Editorial Board, will undoubtedly propel robot learning to unprecedented heights, solidifying its status as the foremost journal for impactful research at the intersection of AI and Machine Learning. Embarking on this exciting journey, we trust that the inaugural volume's first contributions will captivate and inspire our readers. Your engagement and enthusiasm for the evolving field of robot learning are key to the success of this journal. Thank you for joining us on this venture, and we hope you thoroughly enjoy exploring the insights and advancements presented in our inaugural volume.

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Fei Chao received the B.Sc. degree in mechanical engineering from Fuzhou University, Fuzhou, China, the M.Sc. Degree with distinction in computer science from the University of Wales, Aberystwyth, U.K., in 2004 and 2005, respectively, and the Ph.D. degree in robotics from the Aberystwyth University, Wales, U.K., in 2009. He has authored or coauthored more than 120 peer-reviewed journal and conference papers. He is currently an Associate Professor with the School of Informatics, Xiamen University, Xiamen, China, and an Adjunct Research Fellow with Aberystwyth University, Aberystwyth, U.K. His research interests include reinforcement learning for robotics, developmental robotics and autonomous robots.

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Maki K. Habib obtained his Ph.D.-Eng in Intelligent and Autonomous Robots, University of Tsukuba Japan. He was with RIKEN Japan, RISO Laboratories, Japan, and visiting researcher at EPFL, Switzerland. He was a visiting expert under Asian Development Bank, Associate Professor at UTM, Malaysia, and a Senior Manager at MCRIA, Malaysia. He was senior research scientist with GMD—Japan, Associate Professor with Monash University. Then, he was appointed as a full Professor at Swinburne University. He was Invited Professor at KAIST, Korea and Visiting Professor at Saga University, Japan. He is currently a full Professor at American University in Cairo, Egypt. Professor Habib is also the director and the founder of the master programs in Robotics, Control and Smart System (RCSS). He edited six books, and he published more than 230 papers in internationally recognized books, journals and conferences. His research interests includes nanorobotics systems for biomedical purposes, machine learning in cancer detection, diagnosis, and analysis, human adaptive and friendly mechatronics (HAFM), echomechatronics and bioinspired design, service and autonomous robots, including humanitarian demining, robotics for the physically impaired using biological signals (EEG and EMG), electrical autonomous cars/vehicles enhanced by machine learning techniques, pioneering in industry 4.0/5.0, including IoT, Cyber-Physical Systems (CPSs), and WSNs, development of intelligent drone systems: structure, control, intelligence and navigation, research in telecooperation, distributed mixed realities, and collaborative control, intelligent and nonlinear control systems.

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Ibrahim A. Hameed received the Ph.D. degree in AI from Korea University, South Korea, in 2010, and the Ph.D. degree in field robotics from Aarhus University, Denmark, in 2012. He is currently a Professor and the Deputy Head of the Research and Innovation, Department of ICT and Natural Sciences, Faculty of Information Technology and Electrical Engineering, Norwegian University of Science and Technology (NTNU), Ålesund, Norway. His research interests include AI, mechine learning, expert systems, optimization, field robotics, social robotics, and automation.

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Soon-Geul Lee received the B.E. degree in mechanical engineering from Seoul National University, Seoul, South Korea, in 1983, the M.S. degree in production engineering from KAIST, Seoul, South Korea, in 1985, and the Ph.D. degree in mechanical engineering from the University of Michigan, Ann Arbor, Michigan, in 1993. Since 1996, he has been with the Department of Mechanical Engineering, Kyung Hee University, Yongin, South Korea, where he is currently a Professor. He has also served as the Director for the Korean Society of Precision Engineering from 2005 to 2007 and the Institute of Control, Robotics, and Systems in 2006. His research interests include robot navigation, robot control, self-driving vehicle, perception and navigation of USV.

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Pengcheng Liu is an Associate Professor in Robotics and Applied Control at the Department of Computer Science, University of York, UK. He received the BEng and MSc degrees from Zhongyuan University of Technology, China in 2007 and 2012 respectively, and received a PhD degree from Bournemouth University, UK in 2017. Dr. Liu is leading the Computational Autonomous Learning Systems (CALS) laboratory and is a key member of Real-Time and Distributed Systems (RTDS) Research Group, YorRobots, and Institute for Safe Autonomy (ISA), where research facilities have been established to address global challenges in assuring the safety and autonomy of robotics and other systems that use artificial intelligence. His research interests include robotics, machine learning, applied control and bio-inspiration and biomimetics. He has published over 100 referred journal and conference papers in the field of robotics, applied control and AI.

Dr. Giovanni Luca Masala
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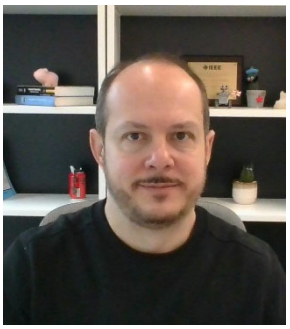

Dr. Giovanni Masala is a Senior Lecturer (Assoc. Professor) in Computer Science and leader of the Cognitive Robotics and Autonomous Systems lab (CoRAS) at the University of Kent (UKC). Furthermore, he is co-lead of the Future Human Research Centre at UKC. Dr. Masala has published many peer-reviewed scientific articles on topics in AI, Robotics and Human Robot Interaction and digital technologies in healthcare. Dr. Masala has a track record of successful grants. He obtained a grant in 2019 as PI for the University of Plymouth funded by the EU Interreg 2 Seas 2014-2020 “AGE Independently (AGE’IN) “to explore the role of digital technologies and robotics for senior care. He was also PI in the 2018 for InnovateUK projects for Machine Learning applications. He was also Co-I for projects with Sardinia Regional Council (Italy), in 2014-2015 with the project “Cloud computing platform for SMEs”, and in 2008-2009 for “Disclosure of information, culture and e-business on the Internet: access for persons with disabilities". Dr. Masala is Associate Editor (AE) in, AE in the International Journal of Environmental Research and Public Health and AE in the International Journal of Robot Learning. He is also a Senior Member of the IEEE Computational Intelligence Society and programme committee member of several international conferences in AI (ECAI, INCoS, SAM, etc).

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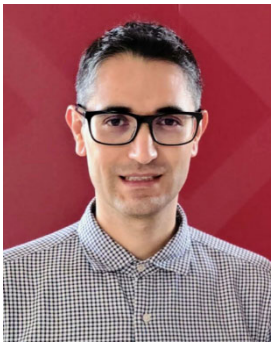

David Navarro-Alarcon received the Ph.D. degree in mechanical and automation engineering from The Chinese University of Hong Kong in 2014. Since 2017, he has been with The Hong Kong Polytechnic University, where he is currently an Associate Professor with the Department of Mechanical Engineering and the Principal Investigator of the Robotics and Machine Intelligence Laboratory. He also serves as an Associate Editor for the IEEE Transactions on Robotics. His current research interests include sensor-based control, robotic manipulation, multi-agent systems.

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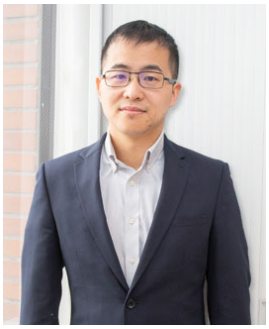

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