



Call For Papers for the Workshop at WCCI2020

Artificial Intelligence for Improving Trustworthiness of Robots and Autonomous Systems

Committee: Dr. Hongmei He*, Prof. John Gray, Prof. Angelo Cangelosi, Prof. Qinggang Meng, Prof T. Martin McGinnity, Prof Jorn Mehnen

***For any query about the workshop, please contact Dr Hongmei He (h.he@cranfield.ac.uk).**

The IEEE WCCI 2020 is the bi-annual IEEE World Congress on Computational Intelligence, which is the largest technical event in the field of computational intelligence. The IEEE WCCI 2020 hosts three conferences of Neural Networks, Evolutionary Computations and Fuzzy Systems. It encourages cross-fertilization of ideas among the three big areas and provides a forum for intellectuals from all over the world to discuss and present their research findings on computational intelligence. IEEE WCCI 2020 will be hosted at the prestigious Scottish Event Campus (SEC), which was a key venue for the Glasgow Commonwealth Games 2014 [<http://www.sec.co.uk>].

Internet of Things (IoT) delivers new value by connecting People, Process and Data. The new paradigm – ‘Internet of robotic things’ was coined in a report of ABI research to denote a concept where sensor data from a variety of sources are fused, processed using local and distributed intelligence and used to control and manipulate objects in the physical world. In the cyber-physical perspective of IoRT, sensor and data analytics technologies from the IoT are used to give robots a wider situational awareness that leads to better task execution. The value of IoRT has been demonstrated in distributed, heterogeneous robot control paradigms like networked robot systems or robot ecologies, or in approaches such as ubiquitous robotics and cloud robotics that place resource-intensive computation on the cloud. IoRT technology could inspire wider applications of robotic and autonomous systems (RAS). NIST’s trustworthiness framework of cyber physical systems covers cybersecurity, privacy, safety, reliability, and resilience. An effective RAS must be trustworthy. Especially the cybersecurity safety, health and interaction of RAS directly affect the development of RAS towards fully autonomous systems without human intervention. Computational Intelligence (CI) is the theory, design, application and development of biologically and linguistically motivated computational paradigms. Conventionally, the three main pillars of CI are Neural Networks, Fuzzy Systems and Evolutionary Computation. Artificial intelligence (AI) is a wider paradigm, including reasoning, knowledge representation, planning, learning, natural language processing, perception and the ability to move and manipulate objects. The three main pillars of techniques in CI have played important roles in AI. The workshop will demonstrate the contribution of computational intelligence techniques in the development of trustworthy RAS.

We now seek paper submissions for the workshop and that such papers should adhere to the standard WCCI length, format and submission deadline (<https://wcci2020.org/submissions/>). This workshop will cover the following topics related to the trustworthiness of RAS through AI techniques and Edge Computing, but not be limited.

- (1) RAS, dealing with anomalies in cyber space
Cognitive cybersecurity, privacy, security by design, privacy by design, as well as anomaly (cyberattack, malware, intrusion, virus, and etc.) detection, etc.
- (2) RAS, dealing with anomalies in surrounding environments
Safe navigation, obstacle detection, obstacle avoidance, pedestrian awareness, etc.
- (3) RAS, self-healing and maintenance of health
Fault detection and diagnosis, system life prediction, etc.
- (4) RAS, autonomy and trustiness in human-robot interaction
Socially intelligent robots, **interpretive AI for Robotic Behaviour, mixed initiative in human-robot interaction.**
- (5) Trusting robots for social-health care, advanced manufacturing, and extreme environments, etc.

Important dates of WCCI2020:

- Paper Submission Deadline: January 15, 2020
- Paper Acceptance Notification Date: March 15, 2020
- Final Paper Submission and Early Registration Deadline: April 15, 2020
- IEEE WCCI 2020, Glasgow, Scotland, UK: July 19-24, 2020

Biography of Committee Members



Dr Hongmei He (SIEEE, FHEA) is a Lecturer in AI & Cybersecurity for Manufacturing and the course director of MSc in Cyber-Secure Manufacturing at Cranfield University. She obtained MSc in Multimedia and Internet Computing and PhD in Computer Science from Loughborough University in 2003 and 2006, respectively. She has the expertise in Artificial Intelligence (AI) / Computational Intelligence (CI), and explored her research to a wide range of applications, such as Internet of Things, Cybersecurity, Robotics, Data/Sensor Fusion, Data Mining, Wireless Sensor Networks, etc. Currently, her research is focusing on AI for the Trustworthiness of Robots and Automation Systems (RAS), especially on the safety and security of autonomous systems (e.g. CAVs, UAVs, etc.). She has published more than 60 papers for the wide applications of Computational Intelligence techniques in peer-reviewed journals, international conferences and book chapters in the area of computational intelligence. She is a senior member of IEEE in Computational Intelligence, RAS, Cybersecurity and WIE societies, and actively serves for IEEE UKRI RAS chapter as the chapter secretary.



Prof John Gray graduated in Electrical Engineering and worked for five years as an avionics design engineer in the aerospace industry before taking up academic research in aspects of control theory and the design instrumentation for fluid flow metering and EM.NDT. In 1988, he established the UK's National Advanced Robotics Research Centre on the campus of Salford University and served as its research director for five years. He has been involved over many years in a series of national and European robotics research programmes including the early development of the iconic Robot.Cub humanoid platform. In 2000 he established the Food Manufacturing Engineering Group (FMEG) with sponsorship from Defra, which was an interdisciplinary industrial academic forum to foster the uptake of modern automation technology in the food manufacturing sector. He has worked for over twenty years as an international consultant on the design of industrial E.M. flow metering, NDT and medical instrumentation. Currently, he is a Professor of Robotics and System Engineering at the University of Manchester, an honorary editor of the Transactions Inst. M. C. and Chair of the IEEE UKI Robotics and Automation Systems Chapter.



Prof Angelo Cangelosi is a Professor of Machine Learning and Robotics at the University of Manchester (UK). He also is Turing Fellow at the Alan Turing Institute London, Visiting Professor at Hohai University, and Visiting Distinguished Fellow at AIST-AIRC Tokyo. His research interests are in developmental robotics, language grounding, human robot-interaction and trust, and robot companions for health and social care. Previously Angelo was Professor of Artificial Intelligence and Cognition, and founding director role, at the Centre for Robotics and Neural Systems at Plymouth University (UK). Cangelosi studied psychology and cognitive science at the Universities of Rome La Sapienza and at the University of Genoa, and was visiting scholar at the University of California San Diego and the University of Southampton. He currently is the coordinator of the EU H2020 Marie Skłodowska-Curie European Industrial Doctorate “APRIL”. He also is Principal investigator for “THRIVE++” (US AFSOR) and the H2020 projects MoveCare, DCOMM and eLADDA. Overall, he has secured over £30m of research grants as coordinator/PI. Cangelosi has produced more than 250 scientific publications, and has been general/bridging chair of numerous workshops and conferences including the IEEE ICDL-EpiRob Conferences (Frankfurt 2011, Osaka 2013, Lisbon 2017, Tokyo 2018). Cangelosi is Editor of the journals *Interaction Studies* and *IET Cognitive Computation and Systems*, and in 2015 was Editor-in-Chief of *IEEE Transactions on Autonomous Development*. His latest book “Developmental Robotics: From Babies to Robots” (MIT Press) was published in January 2015, and recently translated in Chinese and Japanese.



Prof Qinggang Meng is a Professor of Robotics and AI with the Department of Computer Science, Loughborough University, UK. His research interests include biologically inspired learning algorithms and developmental robotics, service robotics, agricultural robotics, robot learning and adaptation, multi-UAV cooperation, human motion analysis and activity recognition, activity pattern detection, pattern recognition, artificial intelligence, computer vision, and embedded intelligence. His research in both theoretical studies and applications of robotics, computer vision and AI is supported by a number of grants from EPSRC, Newton Fund and Innovate UK. Prof. Meng is an Associate Editor for IEEE Transactions on Cybernetics. He has

published more than 100 conference and journal papers in his research area.



Prof T. Martin McGinnity (SMIEEE, FIET) received a First Class (Hons.) degree in Physics in 1975, and a Ph.D degree from the University of Durham, UK in 1979. He currently holds a part-time Professorship in both the Department of Computing and Technology at Nottingham Trent University (NTU), UK and the School of Computing, Engineering and Intelligent Systems at Ulster University. Before taking semi-retirement, he was formerly Pro Vice Chancellor and Head of the College of Science and Technology at NTU, Dean of the School of Science and Technology at NTU, Head of the School of Computing and Intelligent Systems at Ulster University;

Professor of Intelligent Systems Engineering at Ulster University and Director of the Intelligent Systems Research Centre in Ulster University. He is the author or coauthor of 350+ research papers and leads the Computational Neuroscience and Cognitive Robotics research group at NTU. His research interests are focused on Artificial Intelligence, computational neuroscience, modelling of biological information processing and cognitive robotics. His current projects are related to the development of biologically-compatible computational models of human sensory systems, including auditory signal processing; human tactile emulation; human visual processing; sensory processing modalities in cognitive robotics; and implementation of neuromorphic systems on electronics hardware. His work finds applications in industrial robotics, data analytics and medical systems.



Prof Jorn Mehnen's research aims to deliver new and exciting scientific insights as well as practical technological solutions that help industry and academia alike. Advanced Digital Manufacturing encompasses Industry 4.0 technology, Cyber Physical Systems (CPS), Industrial Internet of Things (IIoT) and utilises latest developments in Cloud Manufacturing and Big Data Analytics. His work around Design for Industry 4.0 and Digital Manufacturing is aiming to improve existing Manufacturing Systems to make them smarter, more autonomous and agile, cost efficient, better connected and well informed Through-Life. These efforts are

supported by research into Additive Manufacturing, Data Analytics, Computational Intelligence and Visualisation. His national and international projects aim at high value industrial applications with impact.