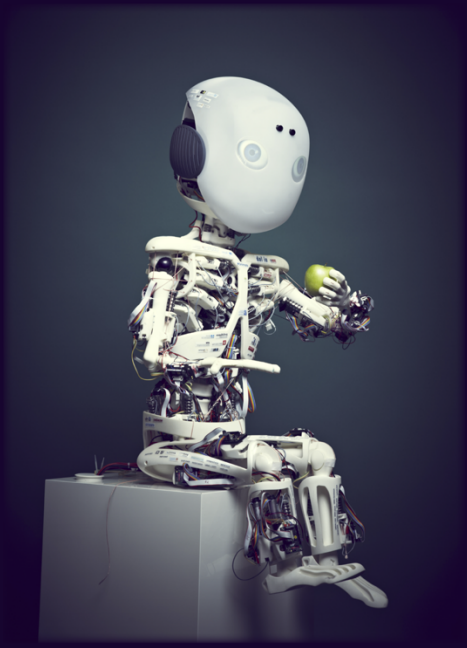
جامعة الإمارات العربية المتحدة
United Arab Emirates University

UAEU College of Humanities and Social Sciences

جامعة نيويورك أبوظبي
NYU ABU DHABI

3rd Joint UAE Symposium on
SOCIAL ROBOTICS

4-5 February, NYU Abu Dhabi, Conference Center
6-7 February, UAE University, Building F3 - Cinema Hall



JSSR2018 is part of Innovation Month 2018

الإمارات تبتكر
UAE INNOVATES

Under the Patronage of
His Excellency
Dr. Ali Rashid Al Noaimi
Chancellor of UAEU

ABOUT UAEU

The first and foremost comprehensive national university in the United Arab Emirates. Founded in 1976 by the late Sheikh Zayed Bin Sultan Al Nahyan, UAEU is a comprehensive, research-intensive university enrolling approximately 14,000 Emirati and international students. As the UAE's flagship university, UAEU offers a full range of accredited, high-quality graduate and undergraduate programs through nine Colleges: Business and Economics; Education; Engineering; Food and Agriculture; Humanities and Social Sciences; IT; Law; Medicine and Health Sciences; and Science.

With a distinguished international faculty, state-of-the art new campus, and full range of student support services, UAEU offers a living-learning environment that is unmatched in the UAE.

ABOUT AL AIN CITY

Al Ain, also known as the Garden City due to its greenery, is the second largest city in the Emirate of Abu Dhabi and the fourth largest city in the United Arab Emirates. With a population of 568,221 (2010), it is located approximately 140 km east of the capital Abu Dhabi and about 120 km south of Dubai.

Al Ain is the birthplace of Sheikh Zayed bin Sultan Al Nahyan, the first president of the United Arab Emirates, and it has the country's highest number of Emirati nationals. Al Ain is located in Abu Dhabi, inland on the border with Oman. The freeways connecting Al Ain, Abu Dhabi and Dubai form a geographic triangle in the center of the country.

ABOUT THE UNITED ARAB EMIRATES

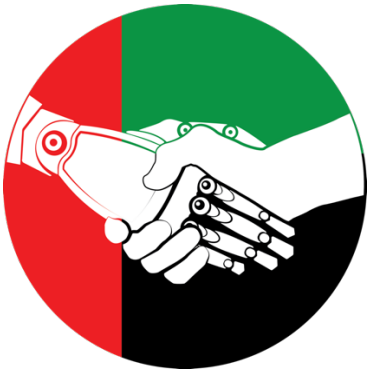
The United Arab Emirates sometimes called the Emirates or the UAE, is an Arab country in the southeast of the Arabian Peninsula on the Arabian Gulf, bordering Oman to the east and Saudi Arabia to the south, as well as sharing sea borders with Qatar and Iran. The UAE is a federation of seven emirates. Each emirate governed by a hereditary emir, one of whom selected as the president of the federation of seven emirates. The constituent emirates are Abu Dhabi, Ajman, Dubai, Fujairah, Ras al-Khaimah, Sharjah, and Umm al-Quwain.

United Arab Emirates University
New York University Abu Dhabi

present

3RD JOINT UAE SYMPOSIUM ON SOCIAL ROBOTICS (JSSR2018)

4-7 February 2018



Registration: SocialRoboticsUAE@uaeu.ac.ae
Website: http://conferences.uaeu.ac.ae/jssr2018/en

THE JOINT UAE SYMPOSIUM ON SOCIAL ROBOTICS

THE FUTURE IS HERE

A future in which robots will be our social companions and will assist us in many of our activities is quickly approaching. To get ready for tomorrow, a new kind of integrated research is gaining unprecedented traction: the study of interactions between humans inspires the development of more sophisticated autonomous agents, scaffolding the creation of the next generation of social robots. At the same time, the study of interactions between intelligent social machines and people provides insights into human social cognition and can inform and validate the explanatory and predictive models advanced by the social sciences.

SOCIAL ROBOTICS

Social robotics connects these two trends, bringing together expertise from different scientific and technological areas such as human-robot interaction, software engineering, artificial intelligence, social and cognitive psychology, the behavioral and brain sciences, social cognition theory, cognitive philosophy and philosophical psychology. Various approaches to cognitive robotics, including developmental, evolutionary, embodied/situated, and “soft” robotics build on the results achieved in these areas.

OUR THIRD MEETING

The United Arab Emirates is quickly emerging as an international hub for innovation. As such, it is committed to foster the progress in robotics, to assess its impact on the life of the people, and to support civil projects that can bring the greatest benefits to society. United Arab Emirates University (UAEU) and New York University Abu Dhabi (NYUAD) have joined forces in organizing the “3rd Joint UAE Symposium on Social Robotics” (JSSR2018) as part of “Innovation Month 2018”. This event features a multidisciplinary program that brings together renowned developers, roboticists, and social scientists from across the globe to discuss the state of the art in social robotics. Join the multi-site event, be part of the group of experts, share your research, check out new robot technology, and discuss the latest innovations in the field.

THEMATIC AREAS

The symposium hosts invited and contributed talks and panel discussions in the following domains:

- Social cognition models and their implementation for human-robot interaction: neuro-robotics and artificial neural networks; theory of mind and simulation theory; narrative-practice hypothesis; enactive theory, interaction theory, and participatory sense-making; mirror neurons and embodied simulation; artificial consciousness and awareness; the frame problem, sensitivity to context, and social decision making.
- psychological aspects of human-robot interaction: anthropomorphism; mind perception, communication, emotion, trust, technology acceptance
- Non-verbal communication and embodied/enactive models of the mind: applications of the embodied/enactive/interactive theory to developmental, evolutionary, and situated robotics; implementation of embodied communication through gaze, touch, gesture.
- Robots in education, tourism, and the entertainment industry: narrative practices; teaching methodologies; learning through interaction; gamification; imagination, creativity, and procedural art; skill acquisition and exercise; machine learning.
- Robots in healthcare and assistive technologies: robot therapy for mental and physical health, autism; tele-presence; sensors and diagnostic software; domotics, lifestyle.
- Robot ethics and machine ethics: algorithmic solutions to moral dilemmas; autonomous agents and responsibility; formalization of codes of conduct; moral and legal obligations towards artificial companions; public policy, self-regulation of the developers, and good practices, trust and close relationships with social robots
- The social impact of robotics: future trends in the job market and technological unemployment; trust; expertise and automation; public policy and autonomous agents; AI in public administration and e-finance; robots, smart cities, and the Internet of things.

PARTNERS

Abu Dhabi University
Khalifa University
UAEU Science & Innovation Park
NYUAD Institute
UAE Society for Human Factors and Ergonomics
PAL Robotics
Votek

KEYNOTE SPEECHES

Ronald Arkin	(Georgia Tech / Queensland University of Technology)
Paolo Dario	(Scuola Superiore Sant'Anna)
Rolf Pfeifer	(University of Zürich)
Giulio Sandini	(Italian Institute of Technology)

INVITED TALKS

Adel Al-Jumaily	(Sydney University of Technology)
Peer Mohammed Ali	(Al Ain Hospital)
Mohammed Alotaibi	(University of Tabuk)
Christoph Bartneck	(University of Canterbury)
Ron Chrisley	(University of Sussex)
Jorge Dias	(Khalifa University)
Luisa Damiano	(University of Messina)
Mona El-Sholkamy	(Mohammed Bin Rashid School of Government)
Francesco Ferro	(PAL Robotics)
Tom Froese	(National Autonomous University of Mexico)
Alessandro Lanteri	(Abu Dhabi University / Hult University London)
Riccardo Manzotti	(IULM / UAEU University)
Omar Mubin	(University of Western Sydney)
Albert Newen	(Ruhr University Bochum)
Maha Salem	(Google / University of Hertfordshire)
Shatha Samman	(UAE Society for Human Factors and Ergonomics)
Selma Sebanovic	(Indiana University)
Shingo Shimoda	(RIKEN BSI Tokyo)
Steve Torrance	(University of Sussex)
Petra Turkama	(Abu Dhabi University)
Antony Tzes	(New York University Abu Dhabi)
Astrid Rosenthal-von der Pütten	(University of Aachen)
Mari Velonaki	(University of New South Wales)
Astrid Weiss	(Vienna University of Technology)
Blay Whitby	(University of Sussex)

CONTRIBUTED TALKS

Salam Abdullah	(Abu Dhabi University)
Waleed Ahmed	(United Arab Emirates University)
Asma AlDarmaki	(United Arab Emirates University)
Muthanna Aziz	(United Arab Emirates University)
Cansu Canca	(National University of Singapore)
Timothy Wiley	(University of New South Wales)
Jacob Zlotowski	(Bielefeld University)

SCIENTIFIC AND ORGANIZING COMMITTEE

Fady Al-Najjar	(United Arab Emirates University)
Massimiliano Cappuccio	(United Arab Emirates University)
Mohamad Eid	(New York University Abu Dhabi)
Friederike Eyssel	(Bielefeld University)

Program of the symposium

Sunday, 4 February 2018 (Bldng 6, Arts Center - NYUAD)

8.30-9.00	On-site registration and breakfast	
9.00-9.10	Conference opening and welcome message	
9.10-11.20	**Morning session - Embodied and Situated Social Robotics**	**Chair: Mohamad Eid**
9.10-10.00	Keynote speech #1 - Living with robots: coping with the "robot/AI hype"	Rolf Pfeifer
10.00-10.40	Invited talk #1 - The peculiarities of robot embodiment	Astrid Rosenthal-von der Pütten
10.40-11.20	Invited talk #2 - How to fail gracefully: understanding and using situational context in interactive systems	Mari Velonaki
11.20-12.20	Exhibition #1 in Building 6 (with coffee break)	

12.20-13.20	Lunch break	
13.20-17.00	**Afternoon session - Models of human-robot Interaction**	**Chair: Fady Al-Najjar**
13.20-14.00	Invited talk #3 - Consumer robots. The need for heed	Steve Torrance
14.00-14.40	Invited talk #4 - Understanding persons and understanding robots: what is overlapping, what is different?	Albert Newen
14.40-15.20	Invited talk #5 - Searching for the conditions of genuine intersubjectivity: From robotics to HCI	Tom Froese
15.20-15.40	Coffee break	
15.40-16.20	Invited talk #6 - Emotions in human-robot co-evolution. Artificial empathy, radical embodiment and synthetic ethics	Luisa Damiano
16.20-17.00	Roundtable #1 - What makes agents social and embodied? 4E cognition and robotics	To be joined by: Giulio Sandini Rolf Pfeifer
17.00-20.00	Tour of Abu Dhabi	
20.00-22.00	Social dinner at "Al Mayas" restaurant	

Monday, 5 February 2018 (Bldng 6, Arts Center - NYUAD)

8.30-9.00	On-site registration and breakfast	
9.00-12.30	**Morning session - Innovative industries and job creation**	**Chair: Friederike Eyssel**
9.00-9.40	Invited talk #7 - First look: The UAE and the future of work	Mona El-Sholkamy
9.40-10.20	Invited talk #8 - TIAGo use cases for services robotics	Francesco Ferro
10.20-11.00	Invited talk #9 - Trust me, I'm a robot! Why we could love a faulty robot but shouldn't trust it with our lives	Maha Salem
11.00-11.20	Coffee break	
11.20-11.50	Contributed talk #1 - Shaping social robots: perceptions and attitudes of UAE users	Salam Abdullah
11.50-12.30	Roundtable #2 - AI as a strategic focus for UAE and KSA	To be joined by: Paolo Dario Shatha Samman

12.30-13.30	Lunch break	
13.30-17.10	**Afternoon session - Cognitive architectures and affective intelligence**	**Chair: Massimiliano Cappuccio**
13.30-14.20	Keynote speech #2 - Social cognition, AI, and robotics	Giulio Sandini
14.20-15.00	Invited talk #10 - Human responsibility, robot mind: conceptual design constraints for social robots	Ron Chrisley
15.00-15.30	Contributed talk #2 - Influences on the morphology and behavior of social robots operating in the workplace	Timothy Wiley
15.30-15.50	Coffee break	
15.50-16.30	Invited talk #11 - The spread mind: a neutral physicalist ontology for intersubjectivity, shared consciousness, and joint attention	Riccardo Manzotti
16.30-17.10	Invited talk #12 - Bayesian user model for distributed learning of user characteristics with networked robots	Jorge Dias
17.40-19.40	Transfer to Al Ain	
20.00-21.30	Dinner at Hotel Danat	

Tuesday, 6 February 2018 (Bldng F3, Cinema Hall – UAEU)

8.30-9.00	On-site registration and breakfast	
9.00-9.10	Conference opening and welcome message	
9.10-11.20	**Morning session: Opportunities and limitations of service robotics**	**Chair: Massimiliano Cappuccio**
9.10-10.00	Keynote speech #3 - The challenge of education and inclusion in the digital and robotics economy	Paolo Dario
10.00-10.40	Invited talk #13 - Assistive robots for the social good: identifying and addressing organizational and societal factors in the design and use of eldercare robots	Selma Šabanović
10.40-11.20	Invited talk #14 - Robot intelligence beyond AI. From space exploration to new barrier-free life with robots	Shingo Shimoda
11.20-12.20	Exhibition #2 in Science & Innovation Park (with coffee break)	

12.20-13.20	Lunch break	
13.20-17.00	**Afternoon session: Medical robotics and patient care**	**Chair: Fady Al-Najjar**
13.20-14.00	Invited talk #15 - Extraluminal single-port access redundant robots for minimal invasive surgery	Anthony Tzes
14.00-14.40	Invited talk #16 - Pre-commercial procurement for independent living. Case health care robotics	Petra Turkama
14.40-15.20	Invited talk #17 - Investigating the role of social robots in improving diabetic children management and awareness	Mohammed Alotaibi
15.20-15.40	Coffee break	
15.40-16.20	Invited talk #18 - The realism of computational intelligence in biomedical applications	Adel Al-Jumaili
16.20-17.00	Invited talk #19 - What are the expectations of rehabilitation health care services from robotics for the next 5 years?	Peer Mohammed Ali
18.40-20.00	Social dinner at Hotel Mercure, Jabel Hafeet	

Wednesday, 7 February 2018 (Bldng F3, Cinema Hall – UAEU)

8.30-9.00	On-site registration and breakfast	
9.00-12.20	**Morning session - User experience: trust, sociability, usability**	**Chair: Friederike Eyssel**
9.00-9.40	Invited talk #20 - Sociability vs utility. Where are we heading in social robotics?	Astrid Weiss
9.40-10.20	Invited talk #21 - The reality of driving HRI research with NAO. A meta analysis	Omar Mubin
10.20-10.50	Contributed talk #3 - Perception of social robots and their human form	Jakub Zlotowski
10.50-11.10	Coffee break	
11.10-11.50	Invited talk #22 - User experience evaluation of social human-robot interaction	Shatha Samman
11.50-12.20	Contributed talk #4 - Robotics privacy concerns and implications	Asma AlDarmaki, Waleed Ahmed, Muthanna Aziz

12.20-13.20	Lunch break	
13.20-17.10	**Afternoon session - Robot ethics, moral norms, and public policy**	**Chair: Mohamad Eid**
13.20-14.10	Keynote speech #4 - Civilized collaboration: ethical architectures for enforcing legal requirements and mediating social norms in human-robot interaction	Ronald Arkin
14.10-14.50	Invited talk #23 - International regulation of AI: this is the time	Blay Whitby
14.50-15.20	Contributed talk #5 - Institutional review boards for AI: an unintelligent choice	Cansu Canca
15.20-15.40	Coffee break	
15.40-16.20	Invited talk #24 – Robots and racism	Christoph Bartneck
16.20-17.00	Invited talk #25 - Autonomous vehicles and the trolley problem. An experimental investigation into the effect of anthropomorphism on moral judgment.	Alessandro Lanteri
17.00-17.40	Roundtable #3 - Pseudo-persons, virtue ethics, and normativity	To be joined by: Waleed Ahmed William McDonald Steve Torrance
17.40-17.50	Conclusive remarks and end of conference	

ABSTRACTS AND BIOGRAPHICAL NOTES OF SPEAKERS

Contributed talk #1 (NYUAD Conference Center, Building 6)
Shaping social robots: Perceptions and attitudes of UAE users
Salam Abdallah (Abu Dhabi University)

Despite the advances in industrial robots, the notion of social robots has yet to become common in today's world. The social roles expected from these robots and the impact they may hold on the society is therefore important to understand. Though they are already perceived to affect the current human jobs and resources, investigating the preferred tasks robots should perform has become significant. Also, the appearance of robots impacts the social interaction with humans making them a threat to social acceptance. The aim of this study is thus to investigate the impact of robot's appearance and the kind of tasks they are expected to carry out. Further, the role of culture in the choice of appearance is also considered. To carry this out, 62 participants based in UAE for more than 5 years were considered. Participants were asked to draw robots as how they perceive them followed by a questionnaire choosing appropriate tasks for the robots. Four robots were considered for the study; PR2, ASIMO, Ibn Sina and Twendy One. The drawings by the participants were further coded into four categories; Machine-like, Zoomorphic, Humanoid, and Android. The findings reveal that ASIMO and Twendy One were considered most likeable and were preferred to carry out social tasks. Moreover, the less the robot looked like a human the more it was preferred. Likability and threatening appearance as well affect the type of work carried out by the robot. The study expands on existing literature by providing factors that can make them socially acceptable. By designing robots that are culturally and personally perceived to appear and carry out tasks in a certain way can aid in their introduction in to workforce. Designers of social robots can benefit from this study by designing robots that fit these complex and multidimensional expectations.

Salam Abdallah is an IS & T academic and practitioner. He has a PhD in Information Systems from Australia and an MSc degree in Industrial Engineering (Computer Applications) from the United Kingdom. He accumulated over 15 years of experience working as an IT consultant before joining the United Nations Relief and Works Agency for Palestine refugees, overseeing ICT facilities and curriculum development at schools and vocational training centers in UNRWA's entire field of operations. He is a founding member of the Special Interest Group of the Association of Information Systems: ICT and Global Development. Dr. Abdallah is also an active researcher in the field of Information Systems and has published several articles in local and international conferences and journals of repute. Dr. Abdallah has received research grants, teachers' awards, and innovation awards at the university level.

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Contributed talk #4 (UAEU Cinema Hall, Building F3)

Robotics privacy concerns and implications

Asma Rashed Alrahma Aldarmaki, Waleed K. Ahmed, & Muthanna Aziz (United Arab Emirates University)

Robots are artificially intelligent human made machines, programmed by a computer to help h uman beings in various ways and in all sectors. Robotics comes in many shapes and kinds, however they are built to look like, they almost share one goal, which is to aid humans with the help they need for precise tasks in many fields. Robots are used in military services, car production, space exploration, invasive surgeries, underwater explorations, duct cleaning, fight crime, fixing oil spills, investigating hazardous environments, and commercialized agriculture. Moreover, this shows how dependent humans are nowadays on robots to help them fulfill their tasks. It is without any doubt that privacy concerns are raised with the increased dependence on robotics in almost every aspect in human's life. The question is, are robots truly safe? If we choose the "privacy" option, are we really on privacy? Are those artificially smart man-made machines hijacking our personal life and leaving a trace on whatever we browse/ ask them to do? The answer is no. There is nothing such as "privacy" in the digital world. Once you're exploring, surfing the Internet, or asking the robotic machine to fulfill a task you need to be done, your command is saved in a second memory in that device. Even if you "clear history", it is not really cleared. Therefore, your digital footprint is forever saved and easily traceable for higher authorities, when needed. Robots are very delicate as those man-made machines can better a person's life or ruin it. For example, military usage: in such a sensitive place, robotics usage is vital, at the same time it can endanger the life of the people there as it can expose crucial information or plans by the usage of drones (hacking into them) by using common software. "Smaller drones can sweep large areas as well as stake out particular locations by hovering nearby and alerting a base upon detecting activity". Robotic surveillance is not military-limited; law enforcement agencies are using them too, as well as for private entities. Robotics in fact is viable to every person. Adults, children, and elderly can all access the usage of robotics, even when sitting in home. A home robot comes with fully equipped sensors, cameras, laser rangefinders, odor detectors, global positioning systems (GPS), and accelerometers. Which can be connected wirelessly to the Internet. Those robots can be problematic in the "privacy" criteria as once the person is signed up and ready for the machine to start working, by giving it commands or asking it questions, hackers can hack into those machines, trace your house, review bank statements, medical conditions, pictures of you randomly in your house and every other little aspect you've allowed it to know about you. Also, hackers can hijack your safety system at home, making it easier for thieves to access your house whether you're in it or not. For example, the home clearing robot Roomba by iRobot, it features natural language process, as well as image recognition.

Asma Awad Al Darmaki is a 3rd-year undergraduate student of the Aerospace minor at the Department of Mechanical Engineering, UAEU.

Waleed K. Ahmed is a member of the faculty of the Department of Mechanical Engineering, UAEU. He holds a PhD in Mechanical Engineering, and is specialized in Manufacturing, Solid Mechanics, and Blended Learning.

Muthanna Aziz is Senior laboratory specialist in Mechatronics Robotics and Control at the Department of Mechanical Engineering, UAEU. She holds a BSc Degree in Electronics and communication Engineering.

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Invited talk #18 (UAEU Cinema Hall, Building F3)
The realism of computational intelligence in biomedical applications
Adel Al-Jumaily (University of Technology Sydney)

The talk will introduce the problems associated with the biomedical applications based on computational intelligence and will emphasis on the realism of using computational intelligence and possible realistic machine learning. It will cover biosignal processing and pattern recognition; it will highlit on the EMG based driven systems. It will include a novel working myoelectric controller for a hand rehabilitation device that can deal with such issues. The proposed systems are based on computational intelligence techniques that included developing an accurate myoelectric pattern recognition which can work well in amputee and non-amputee subjects and enable amputees wearing powered prostheses to achieve functional mobility, and a novel classifier for acquiring practical, fast and powerful methods to classify finger movements using two EMG channels. It will also cover image pattern recognition for skin cancer and the realism approach.

Adel Al-Jumaily is Associate Professor at the University of Technology Sydney. He holds a PhD in Electrical Engineering (AI). His research area covers the fields Computational Intelligence, Bio- Mechatronics Systems, Health Technology and Biomedical, vision-based cancer diagnosing, and bio-signal/ image pattern recognition. Adel developed a new approach for Electromyogram (EMG) control of prosthetic devices for rehabilitation and contributed to signal/image processing, and computer vision. He has successfully developed many nature based algorithms to solve the bio-signal/ image pattern recognition problems, such as using swarm based fuzzy discriminate analysis and differential evolution based feature subset selection. Adel is serving asEditorial Board Member for a number of journals and as chair or technical committee member for more than 60 international conferences;

He is now Editor-in-Chief of one journal and an Associate Editor-in-Chief of two Journals. He has a breadth of expertise covers a wide area of research and teaching for more 25 years. He is a senior member of IEEE and many other professional committees.

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Invited talk #17 (UAEU Cinema Hall, Building F3)

Investigating the role of social robots in improving diabetic children management and awareness

Mohammed Alotaibi (University of Tabuk)

Type 1 diabetes (T1DM) is one of the chronic diseases, which require special attention, and a wide range of management activities. It is alarming to notice that the T1DM among the children has been increasing in the recent years, which requires special attention. The recent research shows that the use of social robots can help in fulfilling all the requirements like insulin checkup, awareness, education etc. for managing the diabetes among the children. Considering these aspects, this paper investigates the role of social robots in improving diabetes management among the children using a systematic review of recent studies conducted in this specific area. A systematic review approach was used in this study. Four electronic databases including PubMed, IEEE Xplore, ScienceDirect Elsevier and Scopus are considered for searching the papers from the social, engineering and medical perspectives. More than 3,400 titles and abstracts of various papers in these databases were reviewed. Only six papers fitted the criteria that focuses on the use of social robot in enhancing the diabetic children management OR diabetic children awareness or both. The review has found that the use of social robots could contribute in improving the diabetic children management and awareness. The number of existing studies in measuring the impact of social robot is very narrow and there is a big need to expand and evaluate the use of social robot on large sample of diabetic children. Overall, this study found out the use of social robot could contribute in improving diabetes management and awareness with diabetic children.

Mohammed Alotaibi received the BSc in Computer Science from King Saud University in 2008 and MSc degrees in Computer and Information Networks, Essex University, UK (2011). He also got a PhD in Biomedical Informatics from Kingston University London in March 2015. He has served as Vice Dean for Quality and Development at the Scientific Research Deanship at University of Tabuk since October 2015. He also Assistant Professor in Bioinformatics at the Faculty of Computing and Information Technology at University of Tabuk. Dr. Alotaibi is interested in mobile health technology, Robotics and internet of things. he has 14 publications in these areas.

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Keynote speech #4 (UAEU Cinema Hall, Building F3)

Civilized collaboration: Ethical architectures for enforcing legal requirements and mediating social norms in Human-Robot Interaction

Ronald Arkin (Georgia Institute of Technology)

The ways in which we treat each other, typically underpinned by an ethical theory, serve as a foundation for civilized activity. Bounds and requirements are established for normal and acceptable interactions between humans. If we are to create robotic systems to reside among us, they must also adhere to a set of related values that humans operate under. This talk first describes the importance of such conventions in human-robot interaction, then outlines a way forward including the difficult research questions remaining to be confronted in ethical human robot interaction (HRI). In particular, examples involving architectures using ethical governors, moral emotions, responsibility advisors and theories of mind are described in two quite different contexts: warfare and the maintenance of human dignity in healthcare. Even the role of deception must be considered as an important adjunct to HRI, as it may yield more effective intentional and autonomous social robots if properly deployed. Finally, we can consider how robots may eventually be able to engineer more socially just human beings via nudging and the ethical questions associated with using such devices.

Ronald C. Arkin is Regents' Professor, Director of Mobile Robot Laboratory School of Interactive Computing, College of Computing, Georgia Tech. He received the B.S. Degree from the University of Michigan, the M.S. Degree from Stevens Institute of Technology, and a Ph.D. in Computer Science from the University of Massachusetts, Amherst in 1987. He then assumed the position of Assistant Professor in the College of Computing at the Georgia Institute of Technology where he now holds the rank of Regents' Professor and is the Director of the Mobile Robot Laboratory. He also served as the Associate Dean for Research and Space Planning in the College of Computing at Georgia Tech from October 2008 to June 2017. From July 2017 to June 2018, Dr. Arkin is serving as a visiting Fellow/Scientist at the School of Electrical and Computer Science, Queensland University of Technology and the CSIRO Robotics and Autonomous Systems Group, Queensland Centre for Advanced Technologies, Commonwealth Scientific and Industrial Research Organisation, in Brisbane, Australia. During 1997-98, Professor Arkin served as STINT visiting Professor at the Centre for Autonomous Systems at the Royal Institute of Technology (KTH) in Stockholm, Sweden. From June-September 2005, Prof. Arkin held a

Sabbatical Chair at the Sony Intelligence Dynamics Laboratory in Tokyo, Japan and then served as a member of the Robotics and Artificial Intelligence Group at LAAS/CNRS in Toulouse, France from October 2005-August 2006. Dr. Arkin's research interests include behavior-based reactive control and action-oriented perception for mobile robots and unmanned aerial vehicles, hybrid deliberative/reactive software architectures, robot survivability, multiagent robotic systems, biorobotics, human-robot interaction, robot ethics, and learning in autonomous systems. He has over 170 technical publications in these areas. Prof. Arkin has written a textbook entitled Behavior-Based Robotics published by MIT Press in May 1998, co-edited (with G. Bekey) a book entitled Robot Colonies published in 1997, and a book published in Spring 2009 entitled Governing Lethal Behavior in Autonomous Robots published by Chapman-Hall (Taylor & Francis). Funding sources have included the National Science Foundation, DARPA, DTRA, U.S. Army, Savannah River Technology Center, Honda R&D, Samsung, C.S. Draper Laboratory, SAIC, NAVAIR, and the Office of Naval Research. Dr. Arkin serves/served as an Associate Editor for IEEE Intelligent Systems, International Journal of Social Robots, and the Journal of Environmentally Conscious Manufacturing, as a member of the Editorial Boards of Autonomous Robots, Machine Intelligence and Robotic Control, Journal of Intelligent Service Robotics, Journal of Field Robotics, International Journal of Advanced Robotic Systems, and the Journal of Applied Intelligence, and is the Series Editor for the MIT Press book series Intelligent Robotics and Autonomous Agents. He also serves/served as a consultant for several major companies in the area of intelligent robotic systems. He has provided expert testimony to the United Nations, the International Committee of the Red Cross, the Pentagon and others on Autonomous Systems Technology. Prof. Arkin served on the Board of Governors of the IEEE Society on Social Implications of Technology, being elected to a 3-year term (2010-2012) by the membership. He was also elected to serve two consecutive 3-year terms on the Administrative Committee of the IEEE Robotics and Automation Society in both 1999 and 2002, served as a founding co-chair of the IEEE RAS Technical Committee on Robot Ethics from 2004-2009 and co-chair of the Society's Human Rights and Ethics Committee from 2006 to 2011, was the IEEE RAS liaison to the IEEE Society on Social Implications of Technology, and also served on the National Science Foundation's Robotics Council from 2001-2002. In 2001, he received the Outstanding Senior Faculty Research Award from the College of Computing at Georgia Tech, in 2011 he received the Outstanding Achievement in Research Award from the University of Massachusetts Computer Science Department, and was named a Distinguished Lecturer for the IEEE Society on Social Implications of Technology in 2012. He was elected a Fellow of the IEEE in 2003 and is a member of the ACM. Professor Arkin is currently on leave at QUT and CSIRO in Brisbane, Australia from July 2017 to June 2018.

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Invited talk #24 (UAEU Cinema Hall, Building F3)

Robots and racism

Christoph Bartneck (University of Canterbury)

Most robots currently being sold or developed are either stylized with white material or have a metallic appearance. In this research we used the shooter bias paradigm and several questionnaires to investigate if people automatically identify robots as being racialized, such that we might say that some robots are ``White'' while others are ``Asian'', or ``Black''. To do so, we conducted an extended replication of the classic social psychological shooter bias paradigm using robot stimuli to explore whether effects known from human-human intergroup experiments would generalize to robots that were racialized as Black and White. Reaction-time based measures revealed that participants demonstrated `shooter-bias' toward both Black people and robots racialized as Black. Participants were also willing to attribute a race to the robots depending on their racialization and demonstrated a high degree of inter-subject agreement when it came to these attributions.

Christoph Bartneck is an Associate Professor and Director of Postgraduate Studies at the HIT Lab NZ of the University of Canterbury. He has a background in Industrial Design and Human-Computer Interaction, and his projects and studies have been published in leading journals, newspapers, and conferences. His interests lie in the fields of Human-Computer Interaction, Science and Technology Studies, and Visual Design. More specifically, he focuses on the effect of anthropomorphism on human-robot interaction. As a secondary research interest he works on bibliometric analyses, agent based social simulations, and the critical review on scientific processes and policies. In the field of Design Christoph investigates the history of product design, tessellations and photography. He has worked for several international organizations including the Technology Centre of Hannover (Germany), LEGO (Denmark), Eagle River Interactive (USA), Philips Research (Netherlands), ATR (Japan), and Eindhoven University of Technology (Netherlands). Christoph is an associate editor of the International Journal of Social Robotics, the International Journal of Human Computer Studies and Entertainment Computing Journal. Christoph is a member of the New Zealand Institute for Language Brain & Behavior, ACM SIGCHI, The New Zealand Association Of Scientists and Academic Freedom Aotearoa. The press regularly reports on his work, including the New Scientist, Scientific American, Popular Science, Wired, New York Times, The Times, BBC, Huffington Post, Washington Post, The Guardian, and The Economist.

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Contributed talk #5 (UAEU Cinema Hall, Building F3)

Institutional Review Boards for AI: An unintelligent choice

Cansu Canca (National University of Singapore)

With the developments in artificial intelligence (AI), the need for an ethical framework for AI research becomes pressing. In recognition of this need, a growing consensus in academia, the press, and policy discussions favors a system that is modeled after the research ethics framework in bioethics. This framework is one of ethics oversight and compliance, where institutional review boards (IRBs) are the gatekeepers. I argue that this IRB system is ill-equipped to handle AI-specific moral questions. As AI moves from narrow to general intelligence, and eventually gains capacities for moral status, it will present complex and novel moral questions. An ethics compliance system lacks the expertise and involvement with the research progress to provide input on an ongoing basis for ethical issues. Even in narrow AI, we face complex ethical issues such as ethically biased algorithms (as in the case of using AI to calculate the risk factor in criminal justice) and implementation of specific value judgements (as in the case of self-driving cars). As AI moves to general intelligence and beyond, other complex issues arise: How do we ensure that AI's value judgements within its various decisions align with our values, how do we recognize when AI reaches a level of capacity that gives it a moral status, and how should we treat AI as a research subject once it acquires a moral status? Finally, we have to face the question of how to protect humanity if or when AI reaches superintelligence—a question that has to be tackled before the event. Certainly, an IRB system is inadequate in handling any such moral questions. In place of the IRB system, I argue for a two-tier system for ethics input in AI research, where these two parts are in communication: (1) an ethics partnership that aims to construct the policy for the most important and critical questions in AI ethics, and (2) a collaborative system of ethicists and scientists, in which ethicists become a part of design teams. A collaborative system would make ethics an integral part of research and development of AI systems, where the ethical aspects are discussed not to acquire the IRB approval but for its own sake, in detail, and on an ongoing basis. Having ethicists within design teams would also provide a setting to design the technology in ways that encourage ethical use, instead of just limiting its unethical use. On the other hand, an ethics partnership would work on policy making regarding more crucial and higher level moral questions such as how to recognize and treat moral AI subjects and how to protect humanity from AI, while also receiving feedback from ethicists within design teams on everyday issues.

Cansu Canca obtained her PhD in Philosophy from the National University of Singapore with a dissertation on organ markets. She now writes on research ethics governance in artificial intelligence, the ethics of machine learning in health systems, and the moral status of ballet. She was until recently a Lecturer in the Faculty of Medicine and an honorary Assistant Professor in the

Philosophy Department at the University of Hong Kong, and she has been an academic visitor at the Harvard School of Public Health, Harvard Law School, Harvard Medical School, Osaka University, and the World Health Organization. She is the founder of the AI Ethics Lab.

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Invited talk #10 (NYUAD Conference Center, Building 6)
Human responsibility, robot mind: Conceptual design constraints for social robots
Ron Chrisley (University of Sussex)

Advances in social robot design will be achieved hand-in-hand with increased clarity in our concepts of responsibility, folk psychology, and (machine) consciousness. 1) Since robots will not, in the near future, be responsible agents, avoiding some moral hazards (e.g., that of abdication of responsibility) will require designs that assist in tracing complex lines of responsibility backwards from outcomes, through the robot, and back to the appropriate humans and/or social institutions. 2) An intuitive understanding by human users of the (possibly quite alien) perceptual and cognitive predicament of robots will be essential to improving cooperation with them, as well as assisting diagnosis, robot training, and the design process itself. Synthetic phenomenology is the attempt to combine robot designs with assistive technologies such as virtual reality to make the experience-like states of cognitive robots understandable to users. 3) Making robot minds more like our own would be facilitated by finding designs that make robots susceptible to the same (mis-)conceptions concerning perception, experience and consciousness that humans have. Making a conscious-like robot will thus involve making robots that find it natural to believe that their inner states are private and non-material. In all three cases, improving robot-human interaction will be as much about an increased understanding of human responsibility, folk psychology and consciousness as it will be about technological breakthroughs in robot hardware and architecture.

Ron Chrisley is Reader in Philosophy in the School of Engineering and Informatics at the University of Sussex. He received a Bachelors of Science in Symbolic Systems, with honours and distinction, from Stanford University in 1987. He was an AI research assistant at Stanford, NASA, and Xerox PARC, and investigated neural networks for speech recognition as a Fulbright Scholar at the Helsinki University of Technology and at ATR Laboratories in Japan. In 1997 he received a DPhil in Philosophy from the University of Oxford, and in 1992 he took up a lectureship in Philosophy in the School of Cognitive and Computing Sciences at the University of Sussex. From 2001-2003 he was a Leverhulme Research Fellow in Artificial Intelligence at the School of Computer Science at

the University of Birmingham. Since 2003 he has been the director of the Centre for Research in Cognitive Science (COGS) at the University of Sussex, where he is also on the faculty of the Sackler Centre for Consciousness Science.

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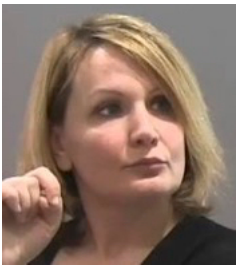
Invited talk #6 (NYUAD Conference Center, Building 6)

Emotions in human-robot co-evolution. Artificial Empathy, Radical Embodiment and Synthetic Ethics

Luisa Damiano (University of Messina)

In the last decades, an increasing number of emerging lines of inquiry in HRI, Cognitive and Social Robotics have been focusing their efforts in developing "Artificial Empathy", that is, a research domain dedicated to produce robots capable of effectively interacting with humans through emotions. The interest of these scientific communities in Artificial Empathy is not surprising. From the point of view of contemporary specialists in robotics, endowing robotic artifacts with "affective competences" is a critical advance, at least for two main reasons. On the one hand, producing "emotional" or "emphatic" robots means to significantly contribute to the genuinely scientific goal of creating artificial models (more precisely: hardware models) of natural cognitive processes – that is, a class of processes to which emotions belong, following the Embodied Approach to the Cognitive Sciences. On the other hand, producing robots capable of interacting with humans on emotional levels means to get closer to achieve the goal that singles out Social Robotics. According to its most diffused definition, this goal consists in producing robotic agents capable of acting as "social partners" for humans. From this perspective, competent emotional interaction appears as a crucial aspect of social robots. It is considered one of the main components of a believable artificial "social presence", and a "social skill" that is essential for embodied agents in order to engage humans in comfortable and potentially long- lasting social interactions. This talk will focus on the nascent field of Artificial Empathy with two interrelated intents: defining the paradigmatic views of emotions underlying its research and production; discussing the implications of these paradigms on human-robot sociality, in particularly with regard to its sustainability. The presentation will be structured in three main parts. The first part will introduce Artificial Empathy, and the rationale defining the epistemological analysis of this field that is proposed. The second part of the presentation will focus on the development and the results of this epistemological exploration. Based on categories of analysis and arguments relevant to contemporary debates in Philosophy of Mind, Cognitive Sciences, and Embodied AI, the talk will connect the main research directions in Artificial Empathy to defined paradigmatic theories of emotions, and, on this basis, will formulate an hypothesis on the evolution of the theoretical paradigms of that are currently active in this field. It will be argued that the domain of Artificial Empathy appears to be engaged in a paradigmatic transition, whose plausible conclusion can be foreseen in the establishment of a research paradigm shaped by a radical version of the Embodied Approach to the Cognitive Sciences. The third part of the talk will consider the potential implications of this paradigmatic transition on the production of Artificial Empathy, and on

the imminent diffusion of the robots it produces in our social ecologies. Based on these considerations, the presentation will take position in the current ethical debate on social robots. It will criticize the diffuse attitude that *a priori* condemns them as "cheating" or "fooling" technologies, and will argue in favor of a critical and experimentally-based ethical approach to Social Robotics called "Synthetic Ethics".



Luisa Damiano (PhD in Epistemology of Complex Systems) is Associate Professor of Logic and Philosophy of Science at the University of Messina (Italy), where she coordinates the Epistemology of the Sciences of the Artificial Research Group (ESARG). Her main research fields are: the Epistemology of the Sciences of Complex Systems, the Epistemology of the Cognitive Sciences, and the Epistemology of the Sciences of the Artificial, with a focus on the synthetic modeling of life and cognition, in particular in Synthetic Biology and in Cognitive, Developmental and Social Robotics. On topics related to Social Robotics she wrote many articles and one book (*Living with Robots*, Harvard University Press, 2017, with P. Dumouchel, originally published in French, Seuil 2016, and being translated into Korean, Japanese, and Italian).

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Keynote speech #3 (UAEU Cinema Hall, Building F3)
The challenge of education and inclusion in the digital and robotics economy
Paolo Dario (Scuola Superiore Sant'Anna)

The rapid growth and consolidation of digital economy, deeply routed on ubiquitous web services and on the emergent use of similarly ubiquitous robots, requires a profound rethinking of traditional education paradigms for developers and users. In a scenario involving extreme solutions, like the so called "UnCollege movement", or focusing on STEM education vs. the classical interdisciplinary paradigm pursued in the last century, the education community is required to "predict the future" and to rapidly adapt current programs to such evolution and to the needs and expectations of both the designers and developers of digital devices and robots and on the users of such technologies. The challenge for responsible decision makers is to understand the global trends and to guide in the right directions innovations in such key factors as education and social interaction. A key point in my talk is that history can be inspirational for this challenge, as in the case of the Renaissance Economy. I will claim – as in the Harvard Business Review, January 2016 – that "Renaissance Florence was a better model for innovation than Silicon Valley is", and that the core of this tremendous accomplishment may well have been the figure of great artist-engineers, sometimes known as "Renaissance Engineers". Concrete and recent examples will be given on educating engineers able to capture the complexity of modern society according to the Renaissance Engineer paradigm (that is, encouraging creativity, communicative abilities and problem-solving skills defined as lifelong competencies). Students can be encouraged to better capture the complexity of modern society by

adopting the new STEAM (Science, Technology, Engineering, ARTS and Math) paradigm. In order to educate better developers and more responsible users in the Digital Economy, Educational Robotics (ER) can be very useful. There is wide consensus that ER, i.e. the use of robots as a tool for teaching, gives students the opportunity to perform learning activities by having fun, and it creates an appealing and effective learning environment. However, a fundamental question is to assess and validate according to rigorous experiments the effectiveness of ER. At my institution, we have addressed this fundamental question in two different ways. First, in the last three years we have created and conducted a training course for teachers on ER, involving about 1.000 teachers. The impact of the course on the teacher ability to deliver ER, and the perception of teachers on the role of ER for the improvement of students' motivation, planning skills, team working, problem solving and creativity development were analyzed quantitatively. Secondly, the impact of ER was studied in terms of children's learning capabilities. Together with a team of psychologists we evaluated, in a sample of more than 200 6-years-old children, the effects of intensive ER training on Executive Functions. Preliminary results showed significant improvement in both visuo-spatial working memory and inhibition skills after the ER-Lab period, and a significant effect also on robot programming skills. To evaluate the role of digital devices and robotics for the inclusion of children at risk, we tested the clinical effectiveness and cost reduction allowed by CareTo, a smart, sensorized, telemonitored baby gym. The very encouraging results of a randomized study in pre-term infants are presented and discussed.

Paolo Dario received his Dr. Eng. Degree in Mechanical Engineering from the University of Pisa, Italy, in 1977. He is currently Professor of Biomedical Robotics at the Scuola Superiore Sant'Anna in Pisa, and teaches course in the M.S. Program in Bionics Engineering jointly organized by the University of Pisa and by the Scuola Superiore Sant'Anna. He is also the Coordinator of the PhD Program in BioRobotics at the Scuola Superiore Sant'Anna. He is currently Visiting Professor at Waseda University, Japan. Since March 1, 2014 he is serving as Visiting Chief Researcher, Biomedical Engineering and Robotics, at Khalifa University, Abu Dhabi, United Arab Emirates. Professor Dario is the recipient of the 1000 Thousand Foreign Talent Award (2016 – 2018) at Tianjin University, China and since 2016, he has been Principal Investigator at the Beijing Advanced Innovation Center for Intelligent Robot Systems at the Beijing Institute of Technology, China. He has been the Director of the BioRobotics Institute of Scuola Superiore Sant'Anna from 2011 to 2017. His main research interests are in the fields of medical robotics, bio - robotics, mechatronics and micro/nanoengineering, and specifically in sensors and actuators for the above applications, and in robotics for rehabilitation. Prof. Dario has served as President of the IEEE Robotics and Automation Society in the years

2002 - 2003. He has been the General Chair of the BioRob'06 Conference (The 1st IEEE/RAS - EMBS International Conference on Biomedical Robotics and Biomechatronics), of ICRA 2007 (International Conference on Robotics and Automation), ISG 2008 (the 6th Conference of the International Society for Gerontechnology) and of the 1st National Congress of Bioengineering (GNB 2008). Prof. Dario is an IEEE Fellow, a Fellow of the European Society on Medical and Biological Engineering, and a recipient of many honors and awards, such as the Joseph Engelberger Award and the IEEE RAS George Saridis Leadership Award in Robotics and Automation for 2014. He is also a member of the Board of the International Foundation of Robotics Research (IFRR). In 2009 he has been appointed Fellow of the School of Engineering of the University of Tokyo.

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Invited talk #12 (NYUAD Conference Center, Building 6)

Bayesian user model for distributed learning of user characteristics with networked robots

Jorge Dias

In this work, we present a Bayesian User Model that is able to learn and estimate user characteristics in a distributed and fault-tolerant manner using data from networked social robots. User-adaptive systems are systems able to automatically adapt to their user's characteristics, effectively compensating for their preferences, skill levels and impairments. Our model determines user characteristics, taking as input evidence gathered by distributed devices, which are clustered to obtain user profiles. The system is modular, with each module determining one characteristic of the user. New observations and measurements are fused with previous information with basis on their information content, in a community of networked robots. The system allows for diverse implementations, such as team of robots assisted by a cloud infrastructure, or the combination of robots with distributed ambient sensors. We aim to show that the sys- tem is able to perform on-line learning, to group users correctly and achieve fault-tolerance. To that end, tests were run on two experimental datasets, obtained from simulated experiments and with real users. This technique advances the state of the art in the areas of AAL and user-adaptive systems, and in could-connected robots and Internet of Things (IoT), allowing for these heterogeneous and naturally - distributed teams of devices to better model their users, potentially achieving higher levels of autonomy in interaction.

Jorge Dias holds a Habilitation degree and a PhD degree in Electrical Engineering from the University of Coimbra, Portugal, with specialization in Control and Instrumentation. His research is in the area of vomputer vision and robotics and he has contributed to these fields since 1984. He has several publications in international journals, books, and

conferences. Jorge Dias has been principal investigator from several research projects. Jorge Dias published several articles in the area of Computer Vision and Robotics that include more 80 publications in international journals, one published book, 15 books chapters, and 279 articles in international conferences with peer-review. The research activities of Jorge Dias have been concentrated in the Artificial Perception Laboratory from Instituto of Systems and Robotics. Jorge Dias's coordination leveraged the Laboratory to be involved in over a dozen international cooperation projects, CyberMove - Cybernetic Transportation Systems for the Cities of Tomorrow (EC-RTD Project, EVK4 – 2001), VISOR - Visual Perception System for a Social Robot (EURON-European Robotics Research Network), IRPS - Intelligent Robotic Porter System (EU-IRPS FP6-IST-45048), BACS - Bayesian Approach to Cognitive Systems (FP6-IST-027140), PROMETHEUS - Prediction and interpretation of human behaviour based on probabilistic structures and heterogeneous sensors (FP7 - 214901) and HANDLE - Developmental pathway towards autonomy and dexterity in robot in-hand manipulation (FP7-2008– 231640), Social Robot (FP7 Marie Curie - 285870) and in over 25 national projects: CHOPIN - Cooperation between Human and rObotic teams in catastroPhic Incidents, TICE Mobilidade, TICE Healthy, DIVA – Instrumented Airship for Aerial Surveilling. Since July 2011, Jorge Dias is on leave of absence to setup the Robotics Institute and research activities inn robotics at Khalifa University (Abu Dhabi, UAE). He has beenappointed as a Professor of ECE/Robotics at Khalifa University, Abu Dhabi.

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Invited talk #7 (NYUAD Conference Center, Building 6)
First look: he UAE and the future of work
Mona Mostafa El-Sholkamy (Mohammed Bin Rashid School of Government)

The future of work is undergoing major shifts, driven by various forces from technological developments to demographic realities. Due to the nature of its workforce and labor market, the UAE is deeply impacted by these global transformations. As a result, it has demonstrated unwavering commitment towards investing in its local talent, innovation and entrepreneurship initiatives, as well as technological adoption. However, the pace by which global markets and industries are changing presents various challenges. To succeed at advancing its vision for innovation and global competitiveness the UAE must effectively respond to these challenges and anticipate their impact on the labor force. This working paper addresses the key drivers of change impacting the future of work in the UAE and the technological drivers of these changes, characterized as part of the 'Fourth Industrial Revolution'. Their impact on industry and work will be addressed, and the current strategies employed to respond to these changes will be highlighted. By acknowledging dynamics impacting the future of work, the UAE can fully embrace these change drivers, advancing its national vision of becoming a knowledge-based economy, and ushering in a new era in the country's history.

Mona Mostafa El-Sholkamy is an Assistant Professor at the Mohammed Bin Rashid School of Government (MBRSG). Dr. El-Sholkamy was awarded a PhD in Public Administration from the Faculty of Political Science and Economics, Cairo University, Egypt. Prior to that, she received her Masters degree with Highest Honors from the American University in Cairo, Egypt, in the same field, while specializing in International Business. Complemented with a Bachelors degree in Economics from the latter, Dr. El-Sholkamy has created for herself a comprehensive realm of knowledge in the fields of Business Studies, Economics, and Public Administration. El-Sholkamy is an affiliate of the Microeconomics of Competitiveness Network, Harvard Business School, Harvard University, USA. She is also a member of the Public Policy and Administration alumni board of the American University in Cairo (MPA Program), as well as the Global Development network, a worldwide network of research and policy institutes working to provide new perspectives to the development challenges around the world. She has published a number of peer-reviewed academic papers and participated in several international conferences, all of which focused on her research interests of Public Administration, Foreign Aid Management, Sustainable Development, Education, Human Capital Development, Macroeconomic Policy reform, among others. Dr. El-Sholkamy has been teaching at both undergraduate and graduate levels in both national and international institutions.

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Invited talk #8 (NYUAD Conference Center, Building 6)
TIAGo use cases for services robotics
Francesco Ferro (PAL Robotics)

TIAGo's one and only mission is to assist people. This had a clear effect on the PAL Robotics' mobile manipulator design, which enables it to properly interact with the environment and with common tools in multiple situations. Now TIAGo stands as one of the most relevant platforms that can revolutionize how we live, with a huge potential to help people at a domestic and industrial level. The robot combines advanced navigation with perception and manipulation skills and AI to accomplish small tasks to increase the comfort of old, disabled or average people at home. Such tasks go from manipulating objects and tools (putting a dishwasher, placing groceries, preparing a tea, etc.) to socially engaging with people around (reminding a person to take medication, receiving people at home, enabling telepresence, calling emergencies, etc). Besides domestic applications, TIAGo's Human - Robot interaction skills make it suitable for other areas. Its collaborative skills are also relevant for Industry 4.0, where it becomes an interactive assistant for industrial operators. With the goal of protecting their health and improving work conditions, TIAGo can help out in tasks that need of capabilities limited by the human nature itself, or those which may threaten health. Undertaking very precise tasks, repetitive actions for a long time, or sensing the environment are some examples of that. TIAGo can be commanded

by the operator or tele-operated to become a collaborator that makes work more dynamic, efficient and safe in the light industry.

Francesco Ferro is CEO of PAL Robotics and he obtained an MSc in Telecommunications Engineering in 2002 from the Politecnico di Torino, Turin, in Italy. He began a PhD in Computer Vision, but left in 2004 to found PAL Robotics. Concentrating initially on the development of stereo vision algorithms and autonomous robot navigation, in 2008 Francesco became the manager of PAL Robotics' software department. Francesco completed an MBA at the UB University in Barcelona, and was appointed CEO of the company in 2011. Passionate about the development of collaborative humanoid robots, Francesco oversaw production of the first fully autonomous biped robot in Europe. Now one of the leading robotics companies in the world, PAL Robotics is involved in a wide range of European research projects and collaborations that aim to improve our everyday lives. Over the last 17 years, the award-winning company has successfully built robots for services and research, contributed to open-source projects and participated in several major robotics competitions.

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Invited talk #5 (NYUAD Conference Center, Building 6)
Searching for the conditions of genuine intersubjectivity: From robotics to HCI
Tom Froese (National Autonomous University of Mexico)

Many our most valued experiences are experiences that we share with others. Yet the basis for this sense of we-ness remains mysterious. Could it really be possible that two people share one and the same experience? How so? I will argue that enactivists are starting to identify the conditions of this kind of genuine intersubjectivity. To be fair, theory of mind approaches to social cognition have also come a long way from folk psychological theorizing by paying more attention to neuroscientific evidence and phenomenological insights. This has led to hybrid accounts that incorporate automatic processing and allow an instrumental role for perception and interaction. However, two foundational assumptions remain unquestioned. First, the *cognitive unconscious*: explanations assume there is a privileged domain of sub-personal mechanisms that operate in terms of representational personal-level concepts (belief, desire, inference, pretense, etc.), albeit unconsciously. Second, *methodolog ical individualism*: such explanations of social capacities are limited to mechanisms contained within the individual. The enactive approach has broken free from these representationalist-internalist conceptual constraints by directly integrating personal-level phenomenology with multi-scale dynamics occurring within and between subjects. Complex systems analyses of social robotics and agent-based models have demonstrated

that there is nothing mysterious about the possibility of cognitive activity being distributed in a multi-agent system. Experimental investigations of real-time embodied social interaction mediated by human-computer interfaces demonstrate that co-regulation of interaction dynamics makes a difference to experience. This formal and empirical research on social interaction supports the possibility of *genuine intersubjectivity*: we can directly participate in the unfolding of each other's experience.

Tom Froese is a faculty member in the Department of Computer Sciences of the Institute for Applied Mathematics and Systems Research at the National Autonomous University of Mexico. He is the coordinator of the 4E Cognition Group, and a member of the Center for Complexity Sciences, both at the same university. Froese is Editor-in-Chief of the journal *Adaptive Behavior*. In 2016 he was the general co-chair of The Fifteenth International Conference on the Simulation and Synthesis of Artificial Life, and in 2017 he was the track chair of the Cognition and Linguistics track of the Conference on Complex Systems. Froese received his Doctorate degree in cognitive science from the University of Sussex, and his Masters degree in computer science and cybernetics from the University of Reading. His current research interests include the origins of life, the origins of human cognition, and the origins of social awareness.

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Invited talk #25 (UAEU Cinema Hall, Building F3)
Autonomous vehicles and the trolley problem. An experimental investigation into the effect of anthropomorphism on moral judgment
Alessandro Lanteri (Abu Dhabi University)

The talk discusses the effect of anthropomorphism on moral judgments across three studies, based on scenarios inspired by the notorious trolley problem. In each scenario, the agent is a driver making a binary decision between staying on the current course and killing some pedestrians or steering onto the opposite lane. The scenarios test a known versus an unknown number of victims, as well as killing a pedestrian versus sacrificing the driver. The three studies compare the attributions of moral judgements by respondents to three agents, with progressive degree of attributed anthropomorphism (this is tested separately): a human being, a humanoid robot, and a driverless car. The studies also control for the effect of the respondents affinity with technology and tendency to attribute anthropomorphic traits to technological artefacts.

Alessandro Lanteri is a Professor of Entrepreneurship at Abu Dhabi University and Hult University London. His research investigates social innovation and ethics. In this seminar he discusses how luck affects the ethical judgment of uncertain outcomes of managerial decisions that unravel in the future.

He founded a business incubator and led open innovation initiatives with several multinational companies (ABB, Ford Motors, UBS, Unilever, Virgin Money). He is an advisor of the World Economic Forum and a business consultant. He holds a Masters degree in Economics from Bocconi and a PhD in Philosophy and Economics from Erasmus University Rotterdam. He has studied, lived, and worked in over 15 global capitals in four continents.

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Invited talk #11 (NYUAD Conference Center, Building 6)

The Spread Mind: a neutral physicalist ontology for intersubjectivity, shared consciousness, and joint attention

Riccardo Manzotti (IULM University of Milan)

What is intersubjectivity? Is it possible to outline a neutral physicalist ontology that does not require any reference to any mentalistic notion? In other words, is it possible to define intersubjectivity without any reference to subjects as something different from physical objects? In order to do so, I suggest to take into consideration a neutral physicalist ontology in which mental states are reduced to relative physical objects brought into existence by bodies. By doing so, the notion of intersubjectivity is revisited in terms of shared physical reality. Elsewhere I have called such a neutral model either the mind-object theory or the spread mind, and it maintains that our conscious states are literally identical with physical objects that take place by means of our bodies and brains. In this paper, I will briefly outline the empirical evidence in support of this apparently radical view. Eventually, I will suggest to model intersubjectivity as the overlapping between collections of external relative objects that bodies bring into existence. By external here I mean external to the brain and the nervous system. Once the mind is taken to be located in the external world, the same object can be shared by more subjects and thus being intersubjective. This view is ontologically parsimonious insofar intersubjectivity is no longer a level over and above a community of subjects whose ontology is, in itself, vague and mentalistic. On the contrary, intersubjectivity is just the case when different bodies partition reality in partially overlapping subsets. An example is provided by joint attention as when subjects perceives reality differently because they perceive also the attention of other subjects. By applying the abovementioned model in which one's experiential world is one with the objects that exist relative to one's body, joint attention occurs when one's experiential world includes, among its relative objects, other subjects' attention and, because of that, the object the other

subject is paying attention to. Attention can thus be modelled as a way to include parts of the world in one's experiential world. From the standpoint of machine learning and roboticist, this proposal is alluring because it is completely neutral both as to the divide between living organisms and machines and as to the divide between subjects and objects.

Riccardo Manzotti has a PhD in Robotics and degrees in The Philosophy of Mind and Computer Science. He teaches Psychology of Perception at IULM University, Milan (Italy), and has been a Fulbright Visiting Scholar at MIT. He has specialized in AI, artificial vision, perception, and, most of all, the issue of consciousness. After working in the field of artificial vision, he focused his research on the nature of phenomenal experience, how it emerges from physical processes and how it is related to objected perceived. His book *The Spread Mind* has just been published (November 2017).

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Invited talk #21 (UAEU Cinema Hall, Building F3)
The reality of driving HRI research with NAO. A meta-analysis
Omar Mubin (Marcs Institute – Western Sydney University)

The Nao robot features as one of the more popular social robots or humanoids employed by researchers. In lieu of this popularity, a meta-analysis of the Nao robot and its specific usages in research studies can portray a number of trends and tendencies of the Human Robot Interaction (HRI) community. We analyzed full papers from the HRI conference and short-listed 49 papers that used the Nao robot in their research studies. We coded these papers on a number of attributes. It was observed that the Nao robot was growing in popularity over the years, particularly in the case of German institutions. The ratio of controlled empirical studies using the Nao robot was particularly high (more than 80%). Speech and gesture dominated as the modality of choice when designing HRI with the Nao robot but the mobility of the Nao robot was severely under-utilised. The absence of a display mechanism augmented within the Nao robot was also realized through the usage of external devices. Educational HRI was emerging as a popular research theme in our sample of papers. In conclusion we speculate on our results and indicate that while our research shows that the Nao robot is a popular social robot, there seems to be particular habits or tendencies followed by the HRI research community when running HRI studies with the Nao robot. We believe that while this may be influenced by the specific needs of the HRI conference; the features, traits and attributes of the Nao robot are seemingly also playing a role.

Omar Mubin is a Senior Lecturer at the School of Computing, Engineering and Mathematics at Western Sydney University, Australia. Prior to being employed at Western Sydney University, Omar Mubin was a post-doctoral researcher in Human-Computer Interaction at Ecole Polytechnic Federale de Lausanne (EPFL), Switzerland. Omar Mubin completed his PhD doctorate qualification in Human Robot Interaction from the Eindhoven University of Technology, the Netherlands in 2011. He was also a visiting researcher at Philips Research Eindhoven in 2007 during his 2-year tenure as a research trainee at the Eindhoven University of Technology, which resulted in him being awarded a PDEng degree in 2007. Dr. Mubin has a MSc in Interactive Systems from KTH (Royal Institute of Technology), Stockholm, Sweden. His research interests comprise of Human Computer Interaction, social robotics (and the perception of humans of them thereof), exploring the role of robots in education, Empirical research in Human Computer Interaction, persuasive technology, design for development and user-centered design. He has authored/co-authored more than 60 articles in peer reviewed conferences and journals in the areas of Human Computer Interaction and Human Robot Interaction.

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Invited talk #4 (NYUAD Conference Center, Building 6)

Understanding persons and understanding robots: What is overlapping, what is different?

Albert Newen (Ruhr-Universität Bochum)

Concerning robots, we should pose the same question as we do concerning persons. Concerning persons, we ask “How do we understand others?” and search for the best theory which describes 1. how we actually manage to do it, and 2., how we can account for deficits in social understanding of people, e.g., in the case of autism and 3. which abilities underlie the standard performance of understanding other human beings. I suggest that this framework is helpful to develop a theory of understanding robots: of course we have to make adjustment since robots lack certain abilities of humans but the framework is just the right way to proceed to account for the new revolution which leads to a participation of robots in our everyday life in many dimensions. I will start with a short outline of a theory of understanding other human beings, i.e., the *Person Model Theory* which I developed in detail (e.g. Newen 2015: www.open-mind.net). The main claim is that we understand other human beings on the basis of person models while we develop of ourselves, of other individuals and of groups of persons. These person models are the basis for the registration and evaluation of persons as having mental as well as physical properties. Since there are two ways of understanding other minds (implicit and explicit mindreading), I argue that there are two kinds of person models: Very early in life we already develop *implicit person*

schemata: A person schema is an implicit unity of sensory-motor abilities and basic mental phenomena related to one human being (or a group of humans). In normal ontogeny we also develop *explicit person images*: A person image is a unity of explicitly registered mental and physical phenomena related to one human being (or a group). In a second step I will argue that we can fruitfully make use of this framework to analyse our understanding of recently developed and in the near future available robots which will support us in keeping the house clean, in caring for the kitchen, for the car and for the garden. The essential step is that we evaluate robots as ***agents*** who are doing activities rather similar to human agents. The activities are no longer simply based on implemented regularities but on autonomous learning processes which include extensive learning by experience. This includes learning the preferences of humans, the robots are interacting with. Intelligent robots share with humans, the dimension of agency while they lack the dimension of subjective experience and affective evaluations. Thus, we need to constrain the person model into *agent models* while those are already rich models which can include 1. goal-directed actions, 2. sensitivity for the preferences of other agents, and 3. cognitive perspective taking. This allows us to understand robots as interacting partner for supporting our actions or doing joint activities. Thus includes a new understanding of *minimal responsibility* which is connected to this dimension of agency. In the talk the agency model will be discussed in the light of recent developments of robots as well as the challenges for the remaining differences between human and robots.

Albert Newen became Professor of Philosophy at the Ruhr-University Bochum (RUB) in 2007, one of the top twelve leading research universities of Germany. Furthermore, he is the Director of the interdisciplinary *Center for Mind, Brain and Cognitive Evolution* at RUB since 2011. He received several research awards including a PhD Award of the University Bielefeld, the Bennigsen-Foerder Award of the state North-Rhine Westphaalia as well as the price for “Philosophy in Psychiatry” awarded by the Society of Psychiatry (DGPPN). He was Research Fellow or Guest Professor in Oxford, Stanford and Urbana-Champagne. His interdisciplinary research is combining philosophical theory formation intensely with research in psychology, psychiatry and neurosciences. Since June 2017, he is the speaker of an interdisciplinary Research Training Group (based in Bochum and Osnabrück) working on “Situated Cognition” with a funding of 3.5 Mio Euro (National Research Foundation DFG). He has published more than 100 articles in peer-reviewed journals, edited 15 books in English and German as well as numerous special issues in journals like “Consciousness & Cognition” and “Erkenntnis”. One edition in press is: Newen, de Bruin, Gallagher (eds): Oxford Handbook of 4E Cognition, Oxford: OUP (to appear: summer 2018).

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Invited talk #19 (UAEU Cinema Hall, Building F3)

What are the expectations of rehabilitation health care services from robotics for the next 5 years?

Peer Mohamad Muhamed Ali (Al Ain Hospital)

Rehabilitation using robotics is generally well tolerated by patients, and has been found to be an effective adjunct to therapy in individuals suffering from motor impairments. The objectives of the presentation are to discuss developing implementable technologies that can be easily used by patients, therapists, and clinicians; enhancing the efficacy of clinician's therapies; and increasing the ease of activities in the daily lives of patients.The avenues where increased collaboration is required over the next 5 years - rehabilitation and assistive robotics, computational neurorehabilitation, Robotics for clinical neuroscience, neuromodulation, socially interactive robotics, brain-machine interfaces in rehabilitation, wearable devices, neural processes of rehabilitation, prosthetics and orthotics, are explored. The need for development of robotic devices tailored for assisting different sensorimotor functions, development of different schemes of assisting therapeutic training, and assessment of sensorimotor performance of patient are discussed.

Peer Mohamad Muhamed Ali graduated from Chennai, India, in 1998 after completing his Bachelors in Physiotherapy and was awarded the Best outgoing student with first rank. After graduation, he joined a Harvard Medical International associate institution- Sri Ramachandra Medical Centre. Peer did his Masters in Physiotherapy in Cardiopulmonary Sciences from the same institution. He moved to Abu Dhabi, in June 2006 to join Sheikh Khalifa Medical City, and transferred to Al Ain Hospital, United Arab Emirates in September 2009 as Senior Physiotherapist. Currently, he is Supervisor of Physiotherapy and BLS Training center faculty for the American Heart Association. Peer is a Member of American Heart Association, WCPT Network for Health Promotion in Life and Work, WCPT Network for Physical Therapist Educators, International Confederation of Cardiorespiratory Physical Therapists and European Association for Cardiovascular Prevention and Rehabilitation.

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Keynote speech #1 (NYUAD Conference Center, Building 6)

Living with robots - Coping with the "Robot/AI Hype"

Rolf Pfeifer (Shanghai Jiao Tong University / University of Zürich)

Artificial Intelligence, or AI, has a history of hypes. I will argue that for a number of years in the area of social and service robotics, there has been and there still is a huge robotic/AI

hype and that we are facing a big danger that the bubble will burst if we – engineers, scientists, entrepreneurs – don't manage to deliver on the promises. And we must design and build robots that do have useful sensory-motor functionality that goes beyond merely talking and smiling. Although robots have been around for more than half a century, the term has acquired an entirely new quality since robots, roughly 25 years ago, started leaving the factory floors moving into our own living space. We propose to cope with the robotic hype on the one hand by honest, realistic communication and on the other through delivery of robots with manipulation capabilities, i.e. functionality that goes beyond talking, smiling, and shaking hands. This can be achieved by employing the concepts of embodiment, soft robotics and scaffolding. Embodiment captures the idea that natural forms of intelligence always emerge in the interaction of an entire organism with its physical and social environment. The term soft robotics designates a new generation of robots capitalizing, just like human beings, on "soft" designs (e.g. flexible skin, soft tissue, smooth interaction). The concept of scaffolding implies that we exploit constraints from shape, materials, and environment, which often reduces the design complexity to a fraction of what it was originally. The AI Hype largely concerns so-called "deep neural networks", or deep learning, as exemplified by AlphaGo's spectacular wins over the world champion Lee Sedol in 2016. Will we soon be faced with super-intelligent creatures that are going to enslave mankind? I will explain why we are nowhere near an "age of Terminators", so to speak. Finally, I will introduce the ROBOLOUNGE project – a café, bar or lounge where robots instead of humans take care of the well-being of the customers. It is a venue designed to enable customers to "experience the future" in very close interaction with robots in a real-world public environment.

Rolf Pfeifer is currently "Visiting Chair Professor", at Shanghai Jiao Tong University, China, and he is a scientific coordinator at "Living with Robots" Ltd. Moreover, he is co-founder of the National Robotics Center in Switzerland. He holds a Masters degree in physics and mathematics and a PhD in computer science (1979) from the Swiss Federal Institute of Technology (ETH) in Zürich, Switzerland. From 1987-2014, he was Professor of Computer Science at the University of Zürich and director of the Artificial Intelligence Laboratory. He was a visiting professor and research fellow at the Free University of Brussels, the MIT Artificial Intelligence Laboratory in Cambridge, Mass. (US), the Neurosciences Institute (NSI) in San Diego, the Beijing Open Laboratory for Cognitive Science, the Ludwig-Maximilians-University, Munich, the University of São Paolo, Brazil, and the Sony Computer Science Laboratory in Paris. In 2004, he was elected "21st Century COE Professor, Information Science and Technology" at the University of Tokyo. In 2009 he was a visiting professor at the Scuola Superiore Sant'Anna in Pisa, and at Shanghai Jiao Tong University in China and was appointed "Fellow of the School of Engineering" at the University of Tokyo, and in 2016 "Fellow of ECLT", the European Center for Living Technology in Venice, Italy. In 2009 he started the "ShanghAI Lectures" (at Shanghai Jiao Tong University), a global, fully interactive

videoconference-based series on natural and artificial intelligence that now involves over 50 universities from around the planet. From 2014-2017, he was a “Specially Appointed Professor” in Cognitive Neuroscience Robotics at Osaka University. In 2017, he was appointed “Honorary Professor” at the Department of Automation, Shanghai Jiao Tong University. He is a pioneer of the fields of “embodied intelligence” and “soft robotics” which are now rapidly gaining importance and have already had a decisive impact on the fields of artificial intelligence and robotics. His book “How the body shapes the way we think – a new view of intelligence” has been published in English, Chinese, Japanese, Arabic, and French, and is now considered a classic. He developed the humanoid robot “Roboy”, designed specifically for social interaction, which has attracted world-wide media attention, and he is presently pursuing the “ROBOLOUNGE” project, a venue where robots will take care of the well-being of the customers and where people can *experience* the future – i.e,. they can feel what it will be like to interact very closely with robots in a public space.

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Invited talk #13 (UAEU Cinema Hall, Building F3)

Assistive robots for the Social Good: Identifying and addressing organizational and societal factors in the design and use of eldercare robots
Selma Šabanović (Indiana University Bloomington)

Robots are expected to become ubiquitous in the near future, working alongside and with people in everyday environments to provide various societal benefits. In contrast to this broad ranging social vision for robotics applications, evaluations of robots and studies of human-robot interaction have so far focused on more constrained contexts, largely dyadic and small group interactions in laboratories. As a result, we have a limited understanding of how robots are perceived, adopted and supported in open-ended, natural social circumstances in which researchers have little control of the ensuing interactions. This talk will discuss insights from a series of studies of the design and use of socially assistive robots (SARs) for eldercare aimed at expanding our awareness of the broader cultural, organizational, and societal dynamics that affect the use and consequences of robots outside the laboratory. In-home interviews with older adults suggested that existing robot designs reproduce unwanted stereotypes of aging, while naturalistic observation of robot use in a nursing home shows that ongoing labor by various groups of users is needed to produce successful voluntary human-robot interactions. Further comparative studies of robot use in multiple eldercare institutions further showed that the mutual effects of specific robot characteristics (e.g., cost, ease of use, user profile) and organizational setup and resources (e.g., work practices, insurance mechanisms) affected how and whether robots were taken up in the long term. In response to these findings, we started performing participatory design activities robots with older adults and clinicians to provide an opportunity for mutual learning, inspire both sides to think beyond common stereotypes of older adults and robots, and identify non-technical issues of particular concern to clinicians

and older adults that may affect long-term robot adoption. We also applied an assistive robot in month-long interactions with users in their homes to learn how older adults would interact with robots over a longer period of time, and to have empirically informed discussions with older adults and their clinicians about how robot use might be incorporated into their clinical practice. In summary, I will discuss ways to address broader organizational and societal issues in the course of robot design and development, working together with potential users and other stakeholders and engaging with studies at the individual and organizational level to avoid unwanted consequences and create robust social supports that can cope with the inevitable challenges that emerge when we apply assistive robots in society.

Selma Šabanović is an Associate Professor of Informatics and Cognitive Science at Indiana University, Bloomington, where she founded and directs the R-House Human-Robot Interaction Lab. Her research focuses on the design, use, and consequences of socially interactive and assistive robots in different social and cultural contexts, including healthcare institutions, user homes, and various countries, and combines studies of human-robot interaction (HRI) with social robot design. She spent Summer 2014 as a Visiting Professor at Bielefeld University's Cluster of Excellence in Cognitive Interaction Technology (CITEC). Prior to coming to IUB, she was a lecturer in Stanford University's Program in Science, Technology and Society in 2008/2009, and a visiting scholar at the Intelligent Systems Institute in AIST, Tsukuba, Japan and the Robotics Institute at Carnegie Mellon University in 2005. She was awarded IU's Outstanding Junior Faculty Award in 2013, and the Trustee's Teaching Award in 2016. She currently serves as the Co-Editor in Chief of the ACM Transactions on Human-Robot Interaction, and is a General Chair of the ACM/IEEE International Conference on Human-Robot Interaction (HRI 2018). She received her PhD in Science and Technology Studies from Rensselaer Polytechnic Institute in 2007, with a dissertation on the cross-cultural study of social robotics in Japan and the US.

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Invited talk #9 (UAEU Cinema Hall, Building F3)

Trust Me, I'm a Robot! - Why we Could love a faulty robot but shouldn't trust it with our lives

Maha Salem (Google / University of Hertfordshire)

How do humanlike communicative behaviors such as gesture and speech impact human perceptions of a social robot? And what happens when a robot exhibits some behavioral flaws while interacting with humans? Do mistakes made by the robot in collaborative tasks somehow affect its trustworthiness? - While most HRI research aims at enabling robots to

increasingly comply with social norms and user expectations, in this talk we will focus on the opposite, namely on what happens when such norms and expectations are violated.

Maha Salem works as a User Experience Researcher on the Android team in Google's London office. Prior to joining Google, she studied Computer Science (BSc) and Interdisciplinary Media Studies (MSc) before completing a doctorate degree in Engineering with a focus on Human-Robot Interaction (HRI) at Bielefeld University, Germany, in 2012. In 2013, Maha worked as a Research Associate at Carnegie Mellon University in Qatar, where she investigated cultural differences in HRI between users of Arab and Western backgrounds. Later in 2013, Maha became a Research Fellow at the University of Hertfordshire, UK, where her research focused on user trust and safety in HRI. She continues to collaborate with academic researchers and regularly serves as program committee member and chair for various HRI conferences.

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Invited talk #22 (UAEU Cinema Hall, Building F3)
User experience evaluation of social human-robot interaction
Shatha Samman (Human Factors & Ergonomics Society GCC Chapter)

Social human-robot interaction are expected to increase in our daily lives. This global trend will likely happen sooner in this region as the digital evolution index ranked the UAE as one of three countries in the world that stands out for being a leader in highly digital advancement while exhibiting high momentum for driving innovation and intelligent transformations (HBR, 2017). For instance, robots are beginning to replace humans in customer care services with the Dubai Electricity and Water Authority (Dewa) recruiting five robots to staff their customer happiness centers (Kaleej Times, 2017). According to a digital consumer survey that was performed in 26 countries, 76% of the UAE respondents were comfortable with an AI application, 82% citing the availability of AI/robotics anytime is a key reason they prefer it to human interaction, 74% said AI/robotics engagements were faster and more polite than human interaction, and 68% interacted with computer-based applications in the past 12 months (AMEinfo, 2017). For social human-robot interaction to be effective, a need for positive user experience (UX) with foundations in user-centered design principles and systematic evaluation is essential. The aim of this paper is to present findings from a social human-robot interaction UX evaluation in Dubai. Findings from this study will assist in demonstrating the critical role of UX evaluations, proposing further research studies in human-robot interaction, and suggest guiding principles for the design of successful human-centered socially interactive robots.

Shatha Samman has 20 years of leadership experience as a Human Factors Engineer and Research Scientist investigating a broad range of human performance issues in normal & complex operational environments. She is the founder of Global Assessment, a Human Factors/Ergonomics research, design, training and assessment firm located in the USA and GCC region. She also established the Human Factors and Ergonomics Society GCC Chapter headquartered in Dubai and currently serves as the President. Dr. Samman is a Dubai Association Center (DAC) Ambassador. She worked on numerous projects funded by government and industry organizations, including: Saudi Aramco, Laureate Education, Saudi Arabia Ministry of Education, Boeing, Lockheed Martin, British Petroleum, Defense Advanced Research Projects Agency (DARPA), US Naval Air Systems Command, US Office of Naval Research, US Office of the Secretary of Defense, US Army Research Institute, US Army Research Laboratory, and Kodak. Dr. Samman established the Research Division at King Abdulaziz Center for World Culture Saudi Aramco to promote a knowledge society in the Kingdom of Saudi Arabia and was an Adjunct Professor at the University of Central Florida (UCF) in Orlando, Florida. Dr. Samman received her Ph.D. in Applied Experimental and Human Factors Psychology, and holds a Master of Science degree in Industrial Engineering and Management Systems, and a Bachelor of Science degree in Psychology, from UCF. She also received a Bachelor of Science degree in Computer Science from King Abdul-Aziz University, Saudi Arabia. Dr. Samman is authoring/editing a book that will be published by CRC press later this year called “Human Factors and Ergonomics for the Gulf Cooperation Council: Processes, Technologies and Practices”. She has also authored/co-authored numerous journal articles and scientific publications and taught tutorials and workshops at national and international conferences. Dr. Samman’s bicultural (KSA, USA), bilingual (Arabic, English) background and diverse educational expertise and practical experience enable her to create human-centric innovative solutions to address the complex cross-cultural challenges faced by organizations wishing to succeed in today’s global community.

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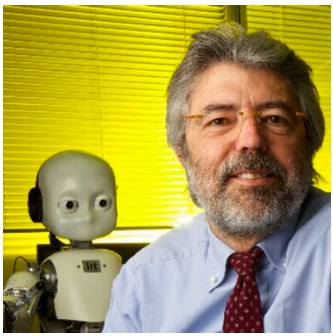
Keynote speech #2 (NYUAD Conference Center, Building 6)
Social cognition, AI and robotics
Giulio Sandini (Italian Institute of Technology)

In recent years, robot technology has advanced dramatically producing machines able to move like a human and, at the same time, being faster, stronger and more resilient than humans. The variety of humanoid robots being built and, to some extent, commercialized has increased enormously since the first humanoid robot announced by Honda 30 years ago. Since then, the complexity and the performance of these systems has been steadily

increasing and nowadays we can claim that more and more sensing and motion abilities of robots are approaching those of humans. Moreover, the computational power of today's computers and the possibility of expanding it through cloud-based solutions, has created the impression that the science fiction world described by Asimov where humans and robots co-exist and collaborate is not very far away. Is this true? Is there some major missing ingredient we have to develop? What is the role of robotics research in this endeavour? Does it still make sense to think to robotics as an engineering activity waiting for the technological solutions required to fulfil Asimov's dream, or should robotics get involved head-on in actively seeking the knowledge which is still missing? During the talk I will argue that robots interacting with humans in everyday situations, even if motorically and sensorially very skilled and extremely clever in action execution are still very much primitive in their ability to understand actions executed by others and that this is the major obstacle for the advancement of social robotics. I will argue that the reason why this is happening is rooted in our limited knowledge about ourselves and the way we interact socially. I will also argue that robotics can serve a very crucial role in advancing this knowledge by joining forces with the communities studying the cognitive aspects of social interaction and the important features of our being humans. In this endeavour robotics can, on one side, provide the physical platform where to test the models of how human perceive and act during social interaction and on the other realize a more humane robot able to execute actions and to establish a mutual communication channel with the human partner in order to discover and fulfil a shared goal (the distinctive mark of human social interaction).



Giulio Sandini is Director of Research at the Italian Institute of Technology and full professor of bioengineering at the University of Genoa. After his graduation in Electronic Engineering (Bioengineering) at the University of Genova in 1976 he was research fellow and assistant professor at the Scuola Normale Superiore in Pisa until 1984. During this period, working at the Laboratorio di Neurofisiologia of the CNR, he investigated aspects of visual processing at the level of single neurons as well as aspects of visual perception in human adults and children. He has been Visiting Research Associate at the Department of Neurology of the Harvard Medical School in Boston where he developed diagnostic techniques based on brain electrical activity mapping. After his return to Genova in 1984 as associate professor, in 1990 he founded the LIRA-Lab (Laboratory for Integrated Advanced Robotics, www.liralab.it). In 1996 he was Visiting Scientist at the Artificial Intelligence Lab of MIT. Since July 2006 Giulio Sandini is on leave of absence from University of Genoa as he has been appointed Director of Research at the Italian Institute of Technology where he has established and is currently directing the department of Robotics, Brain and Cognitive Sciences. RBCS department concentrates on a multidisciplinary approach to human centered technologies encompassing machine learning and artificial cognition, exploring the brain mechanisms at the basis of motor

behavior, learning, multimodal interaction, and sensorimotor integration. The department's multidisciplinary research staff is composed of researchers with different backgrounds (engineers, biologists, psychologists, mathematicians, physicists, medical doctors) addressing four, strictly interconnected, streams of research: Cognitive Robotics; Motor Learning, Assistive and Rehabilitation Robotics, Dynamic Touch and Interaction, Spatial Awareness and Multisensory Integration.

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Invited talk #14 (UAEU Cinema Hall, Building F3)
Robot intelligence beyond AI: from space exploration to new barrier-free life with Robot
Shingo Shimoda (BTCC / RIKEN)

To achieve robot intelligence, different technologies beyond conventional AI are required. Mechanism, sensing and interactions with surroundings are the critical factors for robot intelligence. I will introduce various approaches to robot intelligence, from the intelligent mechanisms serving space exploration robotics to the new concept of barrier-free life with Robot.

Shingo Shimoda is a Unit Leader at Intelligent Behavior Control Unit at BTCC / RIKEN (BSI–TOYOTA collaboration center). He holds a PhD from the Department of Electronics Engineering, University of Tokyo (2005), an MSc from the Department of Environmental studies, University of Tokyo (2001), and a BSc from the Department of Mechano-Infomatics, University of Tokyo (1999).

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Invited talk #3 (NYUAD Conference Center, Building 6)
Consumer robots – The need for heed
Steve Torrance (University of Sussex)

Many consumer devices over the last century have been radically transformative in their social effects. Mass ownership of socially interactive robots may be part of a next wave of such transformation. What lessons can we learn from the historical impacts of past and present consumer devices, in order to choose the best path for the future? Ice-9, in Kurt Vonnegut's 1963 novel *Cat's Cradle*, is the name of a fictional polymorph of water, whose chief characteristics were (a) its freezing point was around 45.8^{o}C rather than 0^{o}C; and (b) when in contact with normal water molecules, it transformed them into Ice-9 molecules. The Ice-9 (or Wooomph!) effect is the indefinitely recursive transformation that occurs if a quantity of Ice-9 is dropped into an expanse of water such as the sea (an event that takes place in the novel). Successful consumer technologies display something analogous to the

Ice-9 effect: when enough people own them, there is an explosive spread of demand and supply. (And, one might add, of disposal – as witness the islands of plastic and expanses of bleached coral reefs in our non-fictional sea.) Many working in social robotics, and in allied fields of AI, seem to act as though their prime professional objective is to achieve Ice-9-like patterns of sale-growth for their product. In this talk I will look at some key issues concerning social transformative technologies with particular reference to social robotics. I will draw on my experience of several years' working as an ethical reviewer for robotics, AI and other sci-tech projects within the European Horizon 2020 framework. A key finding I'll highlight is how *under-scrutinized* the downstream social impacts of research is in AI and related areas, and what we might do to achieve more searching and *democratic* scrutiny. I'll suggest some other things we should alert ourselves to as we head for a point in history where humans become owners of robots *en masse* (and maybe, further down the line, robots become owners of humans).

Steve Torrance is Emeritus Professor of Cognitive Science, Middlesex University, London, UK, and Visiting Senior Research Fellow, School of Engineering and Informatics, University of Sussex, Brighton, UK. He trained in philosophy at Sussex and Oxford. His doctoral work was in the logical status of moral judgments. Since the 1980s he has worked at the intersection of philosophy, psychology, cognitive science and AI and robotic technologies. His recent publications and conference contributions have covered AI and ethical theory; the implications of artificial ethics and artificial consciousness as research goals; the potential status of AI agents as sources and recipients of ethical action; machine ethics in the health and social care domains; singularity theory and transhumanism; technocentrism and ecology; and enactivist approaches to cognition and action. Steve has been a visiting fellow at the University of Sussex since the early 2000s, based in the School of Engineering and Informatics. With Ron Chrisley he was a co-founder of the Centre for Research in Cognitive Science (COGS) at Sussex. He is also Professor Emeritus in Cognitive Science from Middlesex University: before retirement from there he held holding positions, successively, within the subject departments of Philosophy, Computer Science and Psychology. He recently completed nearly a decade as a part-time associate lecturer at Goldsmiths, University of London, and was recently a visiting professor at the University of Twente, in the Netherlands. He was co-organizer and chair of a workshop on Social Robotics and Human Experience, funded by the British Psychological Society and the Sackler Centre, held at Sussex University in April 2017. He has for some years been a technology consultant for the European Commission, currently in the role of expert ethics reviewer for Horizon 2020 and related programmes. He is also a jazz musician, and is currently working with a fellow cognitive scientist in Edinburgh in a collaborative exploration of enactivist theory in relation to jazz improvisation.

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Invited talk #16 (UAEU Cinema Hall, Building F3)

Pre-commercial procurement for independent living – Case health care robotics

Petra Turkama (Abu Dhabi University)

The aging population and raising health care budgets have raised interest toward assisted independent living. Numerous related technological innovations have emerged and new participatory development methodologies developed. However, the role of public sector has remained as passive procurer. Pre-commercial procurement (PCP) is as a promising but under-utilized model for public sector innovation. With this, there are few studies on the application of PCP process in health care sector. This paper presents a novel methodology for participatory development in PCP context. The model is validated through a longitudinal European Commission funded case study on the development of health care robotics for independent living. The developed model contributes to the academic discussion on participatory design methodologies and public sector innovation. The methodology will further support health care professionals in developing and procuring technologies for independent living.

Petra Turkama is Assistant Professor of Management and Director of Innovation Center at Abu Dhabi University. She received her PhD in Science from Lappeenranta University of Technology in 2007. She has worked in techno-commercial roles with Nokia corporation in various countries before joining academia in 2007. Dr. Turkama has broad based experience in innovation and technology management in numerous large scale European and corporate research projects as the director of the innovation enter at Aalto University, Finland. She moved to Abu Dhabi in 2012 and is currently supporting ADU in re-launching the ADU Innovation and Entrepreneurship Center. Dr. Turkama teaches courses related to innovation, entrepreneurship and general business management, and is actively involved in the MoE Entrepreneurship Initiative with the University of Stanford, USA.

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Invited talk #15 (UAEU Cinema Hall, Building F3)

Extraluminal single-port access redundant robots for minimal invasive surgery

Anthony Tzes (New York University Abu Dhabi)

The design and implementation of a redundant manipulator for minimal invasive surgery (MIS) is the subject of this talk. This manipulator has several Degrees-of-Freedom (DoF) and uses tendons made from smart memory alloys (NiTi) in antagonistic manner for control purposes. The developed controllers take into account the hysteresis of the NiTi-wires and provide appropriate compensation. Despite the long slender-rod (11mm diameter) shape

of this MIS-robot, there is an attached dual micro camera system at its tip providing the surgeon with the capability of 3D-vision. Furthermore, the surgeon can enter or remove medical instruments thru a 4mm inner diameter through-hole. The advocated system has been attached to a 5 DoF external manipulator for extraluminal Single-Port Surgical (SPS) operations. The performance of the system is investigated using a visual servoing technique employing fiducial markers for measuring its pose.

Anthony Tzes is a graduate (1985) of University of Patras, Greece and received his PhD (1990) in electrical engineering from Ohio State University. His research interests are in the field of applied control and robotics, focusing in adaptive robust control of networked systems, collaborative control of mobile robots, and surgical robotics. He was the Director of the Instrumentation and Control laboratory and the Tandon School of Engineering (formerly known as Polytechnic University), New York University (1990-9). He was the founder and director of the Applied Networked Mechatronic Systems group during his tenure at the Electrical and Computer Engineering department at University of Patras (1999-2016). Since 2017, he is a Professor in the Engineering Division of the New York University Abu Dhabi, in United Arab Emirates. He is the Director of the Autonomous Robots & Intelligent Systems Lab at NYUAD. Dr. Tzes is a IEEE senior member, chairman of the Greek Committee at EU for the initiatives on "Coherent Development of Policies", the "Regions of Knowledge" and "Research Potential" (2006-2009), and a member of the Greek Delegation of the European Control Association (EUCA) Administrative Council (2001-2007). He has more than 80(225) journal(conference) articles and has been in the organization committees (chairman, program chairman and other positions) of various international conferences and an associate editor in several journals.

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Invited talk #2 (NYUAD Conference Center, Building 6)

How to fail gracefully: Understanding and using situational context in interactive systems

Mari Velonaki (University of New South Wales)

In Social HRI, the context of an interaction can have a significant influence on the interpretation of observations. This is particularly important for interaction that involves people and robots in social settings. Velonaki's presentation will explore how the context of situations involving people, robots and specific environments can best be represented; how the context be inferred from measurements that can readily be made of the participants, the robots and their environment; and how information can best be communicated to the participants in ways that account for the participants' intentions and

the context of the interaction. She will argue that the more comprehensive our situational understanding becomes the more equipped will be to prevent or accommodate failure gracefully.

Mari Velonaki is a Professor of Social Robotics at the University of New South Wales, Sydney. She is the founder and director of the Creative Robotics Lab (Art & Design UNSW) and the founder and director of the National Facility for Human Robot Interaction Research (UNSW, USYD, UTS, St Vincent's Hospital). Mari's robots and interactive installations have been exhibited worldwide, including: Victoria & Albert Museum, London; National Art Museum Beijing; Gyeonggi Museum of Modern Art, Korea; Aros Aarhus Museum of Modern Art, Denmark; Wood Street Galleries, Pittsburgh; Millennium Museum - Beijing Biennale of Electronic Arts; Ars Electronica, Linz; European Media Arts Festival, Osnabruck; ZENDAI Museum of Modern Art, Shanghai; Art Gallery of NSW, Sydney, Museum of Contemporary Arts, Sydney; Conde Duque Museum, Madrid. Mari Velonaki's practice and research is situated in the multi-disciplinary field of Social Robotics. Her approach to Social Robotics has been informed by aesthetics and design principles that stem from the theory and practice of Interactive Media Art. Velonaki has made significant contributions in the areas of Social Robotics, Media Art and Human-Machine Interface Design. Her career outputs across these fields are extensive. Velonaki began working as a media artist/researcher in the field of responsive environments and interactive interface design in 1997. She pioneered experimental interfaces that incorporate movement, speech, touch, breath, electrostatic charge, artificial vision and robotics, allowing for the development of haptic and immersive relationships between participants and interactive agents. Mari's designed her first robots in 2004 as part of a major Australian Research Council (ARC) project 'Fish–Bird' (2004-07) which led at the Australian Centre for Field Robotics (ACFR USYD). In 2006 she founded the Centre for Social Robotics. In 2009 she was awarded an ARC Fellowship (2009–2013) leading to the creation of her humanoid robot 'Diamandini'. In 2014, she was voted by Robohub – a large robotics community of researchers, educators and business- as one of the world's 25 women in robotics you need to know about.

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Invited talk #1 (NYUAD Conference Center, Building 6)
The peculiarities of robot embodiment
Astrid Rosenthal-von der Pütten (Aachen University)

A large amount of research in HRI as well as in the virtual agents community has tried to untangle the effects that different representations of artificial agents have on their users. The major question is whether physically embodied robots outperform virtual agents that

are displayed on a screen, or vice versa. Obviously, virtual agents are not able to manipulate 'real' objects or to get into physical contact with humans. However, in interactions where these capabilities are not essential, robots and virtual agents could be equally successful in interacting with humans. In contrast, virtual representations are often more expressive due to their nearly unrestrained variability in appearance and behavior, what could cause a favorable evaluation of the entity. Overall, quite a number of studies already investigated the effects of robotic and virtual embodiment on varying outcomes such as persuasion, performance and evaluation. According to Li [2015], the results should be taken with caution, since he identified a co-foundation of physical presence and physical embodiment in earlier operationalizations of embodiment. We further stress the complexity to compare earlier results because of the use of a) artificial entities of diverse morphology, b) diverse interaction scenarios and tasks rendering certain bodily-related capabilities of artificial agents more or less salient and important, and c) subjective and objective measures that only indirectly relate to the corporeality of the artificial entity and which were, moreover, not consistently used across studies. It seems obvious that the physical presence of a robot is accompanied by its corporeality and tangibility. The corporeality further leads to assumptions about its capabilities (e.g., a robot is able to move around and carry objects). Typical evaluation dimensions that have been assessed in earlier comparison studies were rather attitudinal and did not take these corporeality related skills into account. A direct measurement of the perception of an artificial entity's corporeality and the inherent capabilities might help to clarify whether theoretical assumptions that have been made about different perceptions of different embodiments are accurate. Furthermore, such measurement could reveal which features are important, and whether they are dependent or independent from the co-presence of the entity. We assume that the capabilities that are crucial in the perception of artificial entities are: Nonverbal Expressiveness, (Shared) Perceptions, Mobility, Tactile Interaction and Corporeality. Nonverbal Expressiveness relates to the entity's ability to express itself with gestures, facial expressions etc. (Shared) Perception refers to perceptual capabilities as vision and hearing that can (but must not be) shared with the human interaction partner. By Mobility we mean the capability to navigate in space, whereas the Tactile Interaction ability refers to physical contact with humans and objects. The core ability that is directly related to the physical embodiment of robots is Corporeality, i.e., the realism and material existence of the entity in the real world. Users' perceptions of these capabilities are hypothesized to be affected by the embodiment of the artificial entity. These perceived capabilities should explain why different embodiments cause different outcomes. Furthermore, these perceptions are supposed to be additionally influenced by moderating variables. The combination of these factors might render the ability of tactile interaction more or less salient. My talk will cover the theoretical framework, the presentation of a newly developed scale and an initial study to test the scale as a tool to explore the theoretical framework.

Astrid Rosenthal-von der Pütten is Professor and Chair of the Individual & Technology group within the HumTec Institute at RWTH Aachen University. Astrid received the B.S. and MS. degrees in Applied Cognitive and Media Science from the University of Duisburg-Essen, Duisburg, Germany, in 2007 and 2009 and the Ph.D. degree in psychology from University of Duisburg-Essen in 2014. From 2009 until 2017 she worked in the Department Social Psychology: Media and Communication at the University of Duisburg-Essen, first as a doctoral student and later as a postdoctoral researcher. Her research interests include social effects of artificial entities, human-robot interaction especially the uncanny valley, linguistic alignment with robots and virtual agents, presence and communication in social media. Dr. Rosenthal-von der Pütten was a PhD fellowship holder of the German National Academic Foundation for her work on the uncanny valley hypothesis and a recipient of two outstanding PhD thesis awards. She is an alumna of the Global Young Faculty.

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Invited talk #20 (UAEU Cinema Hall, Building F3)
Sociability vs. utility – Where are we heading in Social Robotics?
Astrid Weiss (Vienna University of Technology)

My talk will focus around a question that is recently more and more present in my head: What are actual useful tasks for Social Robots in future? I will present an overview on my 10 years of research on Human-Robot Interaction (HRI). Being a sociologist by training, I have started my work in HRI in trying to define from a sociological perspective, if robots can be social by definition. I will explain to what degree robots can fulfil the sociological criteria of “social”, namely forms of grouping, binding, mutuality, and reflexivity. I will continue with the presentation of use cases for Social Robotics in projects I was involved and will reflect on the usefulness of the robot’s task in relation to the focus on social cues for intuitive and natural interaction. I will present selected studies of the FP7 EU project “The Interactive Urban Robot (IURO)” and FP7 EU project “HOBBIT – The mutual care robot. The goal of IURO was to find the way to a designated place in town without any previous map knowledge, just by retrieving information from asking pedestrians for directions. The goal of the Hobbit robot was to enable older people to stay longer in their homes, following three main criteria: (1) Emergency detection and handling, (2) fall prevention, (3) providing a “feeling of being safe and supported”. Reflecting on these exemplary studies will lead to the ethical implications of social robot design, especially the potential risks involved when designing robots that show “artificial attachment”. I will

present the Triple-A Model for ethical risk identification including a first taxonomy we developed in order to classify existing social robotics use cases. My talk will close with a discussion on how the utility of a robot and its sociability interrelate and on future application areas for rocial robots. This will involve thoughts on (1) how technology determinism shapes our use cases for social robotics, (2) why sociability is not self-sufficient for a robot to be accepted and sustainably used, and (3) how we can take a step back and think a bit more out of the box what reasonable useful jobs social robots could do for us in future, going beyond the multifunctional housekeeper scenario.

Astrid Weiss is a Senior Researcher at Vienna University of Technology (Austria). Her current research focuses on long-term human-robot interaction with service/companion robots. Hregeneral research interests are user-centered design and evaluation studies for Human-Computer Interaction and Human-Robot Interaction with a focus on in-the-wild studies and controlled experiments. She is especially interested in the impact technology has on our everyday life and what makes people accept or reject technology. Astrid holds a Masters degree in Sociology and a PhD in Social Sciences from the University of Salzburg. During her studies, she specialized on methodologies of empirical social research and applied statistics. Before my position in Vienna I was a postdoc researcher at the HCI&Usability Unit, of the ICT&S Center, University of Salzburg, Austria and at the Christian Doppler Laboratory on "Contextual Interfaces" at University of Salzburg. From September 2011 until January 2012, she was was on a short-term sabbatical at the University of Amsterdam, Intelligent Systems Lab and the University of Twente, HMI group to work with Vanessa Evers on Cross-Cultural studies in Human-Robot Interaction. Astrid publishes in conferences such as HRI, RO-MAN, and ICSR and journals such as the International Journal of Social Robotics, Autonomous Robots, and the Journal of HRI. She is regularly a member of Program and Organizing Committees related to HRI research.

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Invited talk #23 (UAEU Cinema Hall, Building F3)
International Regulation of AI - This is the time
Blay Whitby (University of Sussex)

It is not too soon to start the process of enacting world-wide standards and controls on Artificial Intelligence and related technologies. Neither is it the case that such controls will inhibit research and development. On the contrary, international standards will stimulate research and allow the introduction of products that are, at present, being deliberately withheld from national markets. Regulation is also necessary to protect vulnerable users

from exploitation and to protect humanity in general from potential misuses of these very powerful technologies. Serious risks are already evident. An historical exemplar of how international regulation has been successfully done will provided. Some existing codes which could form a foundation of The International Artificial Intelligence Regulations will be offered. International regulation of AI is both achievable and beneficial: now is the time!

Blay Whitby is philosopher and ethicist concerned with the social impact of new and emerging technologies. His work has done much to increase informed debate on ethical dilemmas posed by new technology in social and domestic settings. His recent publications in this area include Automating medicine, the ethical way, Do you want a robot lover?, Oversold, unregulated, and unethical: Why we need to respond to robot nannies, On Computable Morality, and Sometimes it's hard to be a robot: A call for action on the ethics of abusing artificial agents. His books on the area include: Reflections on Artificial Intelligence: The Legal, Moral and Ethical Dimensions and Artificial Intelligence, A Handbook of Professionalism. Dr. Whitby is a member of the All Party Parliamentary Advisory Group on AI, the Ethics Group of BCS, The Chartered Institute of IT and an ethical advisor to The Royal Academy of Engineering, and an ethics expert for the EU specializing in AI and robotics. He is a regular speaker in academic, commercial, military, and community settings as well as having participated in several high impact science/art collaborations. Dr. Whitby currently lectures at Imperial College, The Technical University of Vienna, Sussex University, and Brighton and Sussex Medical School.

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Contributed talk #2 (NYUAD Conference Center, Building 6)

Influences on the Morphology and Behavior of Social Robots Operating in the Workplace

Timothy Wiley (University of New South Wales)

A significant challenge for a social robot operating over the long-term, is maintaining a meaningful and enjoyable human-robot interaction~(HRI) on a regular basis after the novelty of the new robot wanes. Our research focuses on two aspects that affect the quality of HRI: (1) the morphology of the social robot, and (2) the intelligent behaviour of the social robot, in particular the robot's ability to adapt to its environment and the people who are present. In this paper, we investigate interactions between humans and a social robot that is an embodied feature of an office workplace over an extended period of time. The contemporary office environment is an ecosystem that hosts humans and intelligent

software, including robots. Our aim is to experiment and understand the evolving dynamics of this shared environment, particularly the context of the social norms of human movement within the environment, both as individuals and as groups. Thus, the social robot does not have a express task, goal or purpose. Instead its purpose is to adapt to these social norms, so that the robot has a higher likelihood of being accepted in the workplace, thereby improving future interactions between workers and the social robot. We present findings from a survey of office workers on the influence on morphology and behaviour of social robots operating in their workplace. We present the conclusions and design principles that should be considered when developing new designs for a social robot. We also propose a online learning method for enabling the robot to actively adapt its behaviour to the social norms of a small group of workers, using an existing hierarchical architecture. This online learning combines symbolic planning with trial-and-error learning to efficiently refine the parameters and variations of a symbolic plan into desirable robot behaviors. Thus, by developing the morphology and intelligent capabilities of a social robot in parallel, meaningful and engaging human-robot interactions can be sustained over the long-term. This research project is funded by Fuji Xerox Japan.

Timothy Wiley is currently a Research Associate at the Creative Robotics Lab at Art & Design, and with the AI & Robotics Research Group in the School of Computer Science and Engineering, both at UNSW Sydney. He has two primary research interests. Firstly, in using autonomous robots as a platform for efficient machine learning, and secondly in investigating explainable artificial intelligence with applications in human-robot interaction. His current research project, in collaboration with Fuji Xerox Japan, intends to improve human-robot interactions on a social robot designed for use in office environments, through online learning techniques that allows a robot to dynamically adapt its behaviour. Timothy recently received his PhD in Computer Science at UNSW Sydney, focusing on robotics and machine learning. His thesis proposes a hybrid framework for efficiently learning new behaviors for autonomous robots from limited data sets and limited online trial-and-error learning.

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Contributed talk #3 (UAEU Cinema Hall, Building F3)
Perception of Social Robots and Their Human Form
Jakub Zlotowski (Bielefeld University)

Since the ancient times people perceive human shapes in non-human objects and depict Gods in their resemblance. Therefore, it should not be surprising that the advancements in technology lead to the development of products that are becoming increasingly similar to

us in their form and behavior. It is especially evident in the field of Social Robotics dominated by humanoids and a growing number of androids. The development of these robots is believed to facilitate Human-Robot Interaction since humans are used to interact with other humans. Furthermore, it helps us to understand better our own nature and what does it mean to be a human. However, less attention has been given to understanding the consequences of anthropomorphism as well as the process itself. Currently, anthropomorphism is used in research to describe humanlike appearance of robots as well as their perception by the users. I will argue that without understanding the psychological process of attributing humanlike properties or characteristics to non-human agents, it may be not possible to compare the findings of various studies. In particular, I propose to differentiate between objective properties of robots and the subjective perception of them by the users, and a possibility of anthropomorphism being an outcome of two distinct processes. I will then discuss the consequences of such distinction on Human-Robot Interaction.

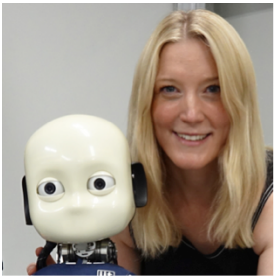
Jakub Zlotowski is a postdoctoral fellow at the Cluster of Excellence Cognitive Interaction Technology (CITEC), Bielefeld University and a visiting fellow at the School of Electrical Engineering and Computer Science, Queensland University of Technology. He received his PhD in Human-Robot Interaction at the University of Canterbury in 2015. His research focus is on anthropomorphism and social aspects of Human-Robot Interaction. He has also conducted research in the field of Android Science. His interdisciplinary research approach spans the areas of Human-Computer Interaction, Social Psychology, Cognitive Science and Machine Learning. He has worked at several international institutions including the University of Salzburg (Austria), ATR (Japan), Osaka University (Japan) and Abu Dhabi University (UAE). He serves as a reviewer for leading journals and conferences in the fields of Human-Robot Interaction, Human-Computer Interaction and Psychology, as well as a major Polish government agency - National Science Centre.

Scientific and organizing committee members

Fady S. Al-Najjar is Assistant Professor of Computer Science and Software Engineering at the College of IT of UAE University. He is also a visiting research scientist at the Intelligent Behavior Control Unit, BSI, RIKEN. He received a M.S. degree from the Department of Human and Artificial Intelligence System at the University Of Fukui, Japan (2007), and a Dr. Eng. degree in System Design Engineering from the same university in 2010. Over the past 3 years, he was interested in brain modeling in aim to understand higher-order cognitive mechanisms. Recently, he started to study motor learning and adaptation from the sensory and muscle synergies perspective in order to suggest practical applications for neural-rehabilitations.

Massimiliano L. Cappuccio is Associate Professor of Cognitive Science at UAE University, where he directs the Interdisciplinary Cognitive Science Lab. His work addresses theoretical issues in embodied cognition and social cognition combining analytic, phenomenological, and empirical perspectives. He is the principal investigator of two UAEU/NRF-sponsored research projects that focus on performance under pressure and human-robot interaction, respectively. He is one of the main organizers and promoters of the yearly Joint UAE Symposium on Social Robotics (JSSR). He is currently editing the *MIT Press Handbook of Embodied Cognition and Sport Psychology.*

Mohamad Eid received the PhD in Electrical and Computer Engineering from the University of Ottawa, Canada, in 2010. He is currently an assistant professor of electrical engineering at New York University Abu Dhabi (NYUAD). He was previously a teaching and research associate at the University of Ottawa from June 2008 until April 2012. He is the co-author of the book: “Haptics Technologies: Bringing Touch to Multimedia”, Springers 2011, the technical chair of the Haptic-Audio-Visual Environment and Gaming (HAVE) symposium in several years (2013, 2014, 2015, and 2017). He is the recipient of the best paper award of DS-RT 2008 conference and the prestigious ACM Multimedia 2009 Grand Challenge. Most Entertaining Award for “HugMe: Synchronous Haptic Teleconferencing” System. He has more than 85 conference and journal publications and 5 patents. His academic interests affective haptics, haptic modeling and tactile stimulation interfaces, and haptic data communication.



Friederike Eyssel is Full Professor of Applied Social Psychology and Gender Research at Center of Excellence Cognitive Interaction Technology (CITEC) at Bielefeld University, Germany, where she heads the Applied Social Psychology and Gender Research Lab. Dr. Eyssel is interested in various research topics ranging from social robotics, social agents, and ambient intelligene to attitue change, prejudice reduction and sexual objectification of women. Crossing disciplines, Dr. Eyssel has published vastly in the field of social psychology, human-robot interaction and social robotics and serves as a reviewer for more than 20 journals. Current third-party funded research projects (DFG, BMBF, FP7) address user experience and smart home technologies, and ethical aspects associated with assistive technology.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