The Emerging Social Neuroscience of Human-Robot Interaction

17 – 18 August 2017
Bangor University
Wales

Programme & Abstracts

PRIFYSGOL BANGOR UNIVERSITY

EPS Experimental Psychology Society

SOCIAL ROBOTS

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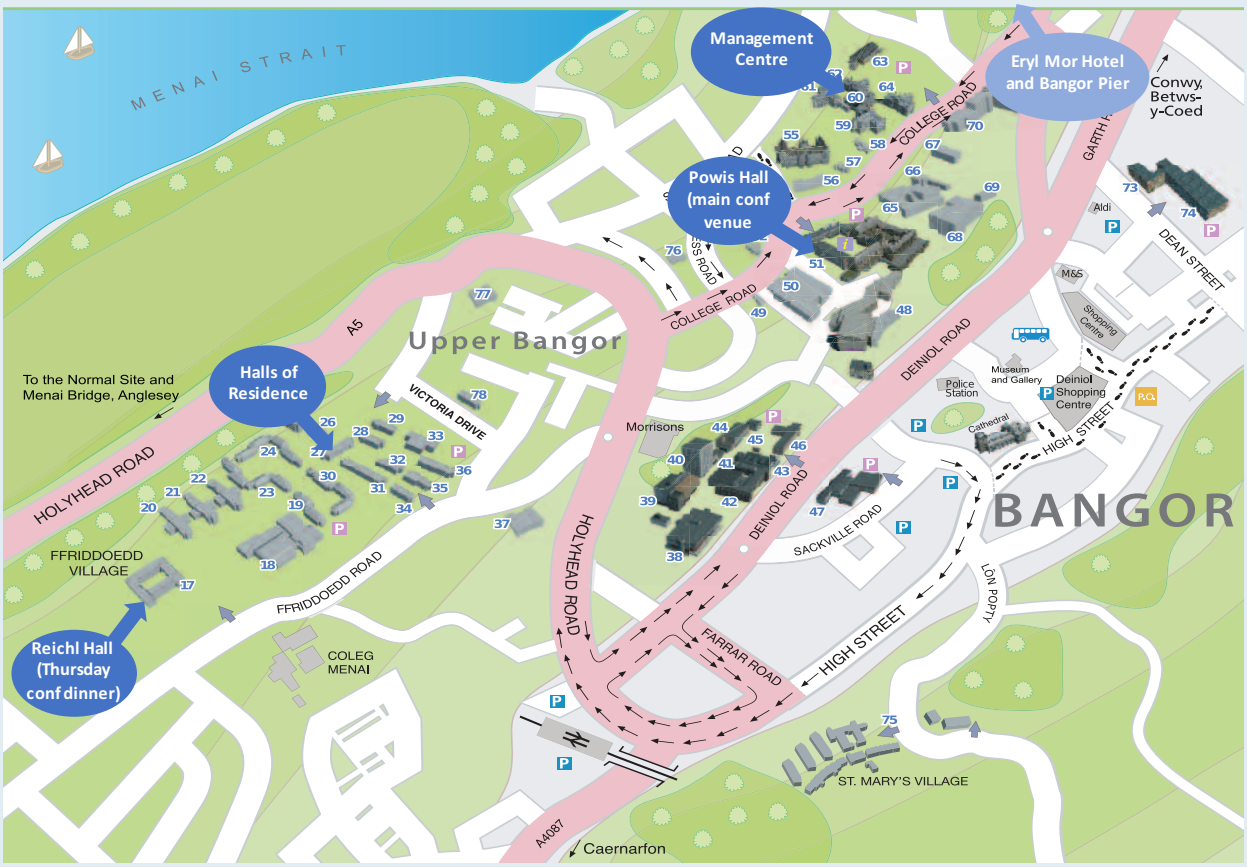
SoBA Lab SOCIAL BRAIN IN ACTION

Map of Useful Locations



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Welcome!

We would like to extend a warm welcome to all delegates to the 2017 Bangor Social Robotics Workshop on the Emerging Social Neuroscience of Human-Robot Interaction, sponsored by the European Research Council and the Experimental Psychology Society.

As interest grows among social neuroscientists, psychologists, and roboticists to understand how humans interact with artificial agents, it will become increasingly important for constructive dialogue and collaboration across these domains. The aim of this workshop is to bring together individuals working within and across a range of disciplines to discuss the latest findings, current challenges and exciting possibilities in human-robot interaction. Together, we will explore social robotics questions using an interdisciplinary lens and discuss several of the major themes attracting increased research attention in this emerging field, from the technical and theoretical foundations of social robotics to the neural mechanisms and developmental and clinical implications of human-robot interactions. This workshop is a variation on the themes explored during the popular Social Cognition workshops held at Bangor University (2015) and the University of Surrey (2014).

To foster diversity, we invited both senior and starting researchers as speakers from a wide variety of disciplines. The workshop features an eclectic mix of keynote lectures, talks and poster presentations and will provide students, postdoctoral fellows and established researchers the opportunity to discuss their latest research on the frontiers of social neuroscience and social robotics in an integrative manner. We are delighted to welcome you to beautiful North Wales for this small-scale meeting of diverse minds, and hope you find the next two days stimulating and enjoyable!

Croeso i Fangor ac hwyl fawr!
Emily S. Cross and Ruud Hortensius, Organisers
Bangor University

Programme – Day 1 – Thursday, 17 August

Venue: Powis Hall, Main Arts Building, Bangor University

Theme 1: Theoretical & Technical Foundations

09:30 – 09:45 Registration and Coffee

09:45 – 10:00 Welcome and Introduction: Emily S. Cross, Bangor University

10:00 – 11:00 **Paper Session 1**
Mary Ellen Foster
University of Glasgow (UK)
Face-to-face conversation with socially intelligent robots

Fulvio Mastrogiovanni
University of Genoa (Italy)
Tactile maps for robots sensing and control

11:00 – 11:30 Coffee

11:30 – 12:30 **Keynote 1**
Martin Giese
Universität Tübingen (Germany)
Physiologically-inspired neural models for visual action recognition and its interaction with action execution

12:30 – 13:30 Lunch

Theme 2: Development and Telepresence

13:30 – 14:30 **Keynote 2**
Goren Gordon
Tel-Aviv University (Israel)
On curiosity of children and robots

14:30 – 15:30 **Paper Session 2**
Hatice Gunes
Cambridge University (UK)
Analysis of affect and personality for autonomous and telepresence robotics

Laura Aymerich-Franch
University of Barcelona (Spain)
In a robot's body: Introducing a new form of mediated embodiment

15:30 – 17:00 Tea & Poster Session

19:00 Workshop Dinner, Reichel Hall (near halls of residence on Ffriddoedd Rd)

Programme – Day 2 – Friday, 18 August

Venue: Powis Hall, Main Arts Building, Bangor University

Theme 3: Social Cognition

09:00 – 09:30	Coffee
09:30 – 10:30	**Keynote 3** **Thierry Chaminade** *Aix-Marseille University (France)* Using artificial agents to investigate human social cognition
10:30 – 11:00	**Paper Session 3** **Agnieszka Wykowska** *Italian Institute of Technology (Italy)* How attribution of intentionality to robots influences social attunement in human-robot interaction
11:00 – 11:30	Coffee
11:30 – 12:30	**Paper Session 4** **Tom Ziemke** *University of Skövde & Linköping University (Sweden)* Intentions, intentionality and interactivity: Challenges for social robotics and social neuroscience **Emily Cross** *Bangor University (UK)* What social robotics can contribute to social cognitive neuroscience
12:30 – 13:30	Lunch and Posters

Theme 4: Uncanny Valley

13:30 – 14:30	**Keynote 4** **Ayşe Saygin** *University of California, San Diego (USA)* Neuroergonomic social robots
14:30 – 15:30	**General Discussion, Future Directions & Impact** **Chair: Kami Koldewyn** *(Bangor University, UK)*
15:30	**Workshop close** *Those who wish can continue discussions at the pub!*

Abstracts – Keynote Speakers

Thierry Chaminade – Using artificial agents to investigate human social cognition
Aix-Marseille University, France

The specificity of my work is to use artificial agents, humanoid robots and computer animated avatars, as controls to highlight which behavioural functions and physiological mechanisms are specific to interacting with a real human (*ie* a social interaction) in contrast to being generic mechanisms exapted to contribute to social functions. For example, processing of the human-shape is a generic mechanism that also responds to human-like robots, whereas the attribution of mental states (*intentional stance*) is specific to interactions with real humans. I will present examples of the applications of these research, that is not limited to knowledge about the physiology of social interactions but also pertains to the understanding of pathologies of social interactions, to scientifically-guided optimization of the social competence of artificial agents, and to the validation and optimization of these artificial agents for the therapies of disorders of social cognition such as the autism spectrum disorder. Finally, I will present new lines of research, currently under development, to investigate higher cognitive processes, in particular related to social interactions and conversations, in naturalistic settings despite the constraints of the fMRI scanning environment. The objective is to naturalize, in terms of physiology (neurophysiology, autonomic system, hormones), complex situations of social interactions that otherwise can't be investigated with a classical experimental approach.

Martin Giese – Physiologically-inspired neural models for visual action recognition and its interaction with action execution
Section Computational Sensomotorics, CIN & HIH, Department of Cognitive Neurology, University Clinic Tübingen, Germany

Action perception and execution are intrinsically linked in the human brain. Consequently, visual action representation involves a whole spectrum of cortical functions, ranging from the visual processing of shape and motion, the processing of spatio-temporal relationships and action semantics, and the interaction of visual representation with neural representations of motor programs. We present a neural theory that has been developed in close connection to neural and behavioural data, which unifies a number of observations in visual action recognition, and its interaction with motor representations. The core of the model is a physiologically-inspired neural hierarchy (deep architecture) that mimics properties of the visual pathway, which is combined with neural field models for the representation of temporal sequences and response selection. This model is extended in different ways to account for experimental data on action recognition and its interaction with motor execution. For the processing of goal-directed actions, the hierarchy has to be extended by special mechanisms that process the spatial relationship between effectors and objects. In order to account for the experimentally observed interaction between action perception and motor execution the model has to be extended by neural representations for motor programs and their dynamic interaction with the visual representation. It is shown that such extended models can account in a unifying manner for a number of experimental results in visual action and causality processing.

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Abstracts – Keynote Speakers

Goren Gordon – On curiosity of children and robots
Curiosity Lab, Tel-Aviv University, Israel

What is curiosity? What is its relation to social robots and children? In this lecture, I will describe new brain-inspired mathematical models of curiosity that allow the creation of quantitative objective assessment tools of curiosity and the appearance of curious social robots. These tools facilitated studies in which children's curiosity was promoted by playing with their curious robotic companion. These robots actively learn about their human peers and personalize their affective interaction in order to encourage learning and curiosity over a long period of time. The integration of these curious social robots into classrooms will also be discussed.

Ayşe Saygin – Neuroergonomic social robots
University of California, San Diego, USA

The Uncanny Valley (UV) hypothesis concerns the design of artificial agents, and posits that the degree of humanlikeness of an agent has a complex relationship to the reaction of humans to the agent. Whereas increased humanlike qualities tend to lead to increased acceptability up to a point, agents that are highly similar to humans but not quite the same can instead cause a negative response. Better understanding, characterization and measurement of the UV is of practical interest as it can pose a challenge to the development of interactive, social artificial agents that are well accepted by humans. The UV is of broader interest to our research however, as it can act as a window onto human perception and social cognition. My team has been one of the primary contributors to the small but growing literature exploring perceptual, cognitive and neural underpinnings of the UV, and in this presentation, I will give an overview of this work. Our interest in this research area is far from limited to the Uncanny Valley, and more broadly concerns human social cognition and human-agent interaction. Our approach is interdisciplinary and cross-methodology. Our goal is on the one hand to improve our understanding of human perception and social cognition, and on the other, to guide the design, development and evaluation of artificial agents that are well designed for their uses and adapted to the brains of their creators.

Abstracts – Paper Sessions

Laura Aymerich-Franch – In a robot's body: Introducing a new form of mediated embodiment
University of Barcelona, Spain

Robot embodiment is a form of mediated embodiment recently emerged which follows similar principles than those used in virtual reality to induce a sense of embodiment of the avatar body. In this talk, I will explain how this illusion is created and will introduce the most exciting findings that we have obtained regarding the psychological effects and behavioral consequences of being embodied in a humanoid robot.

Emily S. Cross – What social robotics can contribute to social cognitive neuroscience
Social Brain in Action Lab, School of Psychology, Bangor University, UK

Social interactions are fundamental to human society, as our ability to perceive, respond to, and coordinate behaviour with others is vital for us to survive and thrive. A major challenge for psychologists and those working in related disciplines is to characterize how we understand and coordinate our actions with others to achieve mutual goals. This challenge is poised to intensify in complexity and importance with the growing presence of artificial agents in everyday human life. Even as robots become ever more ubiquitous in social settings, it is abundantly clear that we do not hold the same expectations for robots as humans, nor do we treat them in the same manner. As such, the ability to recognise cues to human animacy is fundamental for guiding social interactions. Currently, little is known about the relationship between form, motion and knowledge cues to human animacy in terms of cognitive and brain mechanisms that support perception of and interaction with human compared to artificial agents. In this talk, I review a work by my team that explores how these different cues to human animacy modulate engagement of brain regions implicated in social cognition, as well as subjective and objective behavioural measures of social engagement. Overall, this work demonstrate that self-other similarities are not only grounded in physical features, such as form and motion, but can also take different guises. More broadly, this line of research serves to inform the design of artificial agents destined for social settings.

Mary Ellen Foster – Face-to-face conversation with socially intelligent robots
University of Glasgow, UK

When humans engage in face-to-face conversation, they use their voices, faces, and bodies together in a rich, multimodal, continuous, interactive process. For a robot to participate fully in this sort of natural, face-to-face conversation in the real world, it must also be able not only to understand the multimodal communicative signals of its human partners, but also to produce understandable, appropriate, and natural communicative signals in response. I will describe two recent projects which aim to develop robots that support this sort of conversation: the JAMES socially aware robot bartender, and the MuMMER robot, which is a socially intelligent robot designed to interact with people in a public shopping.

Abstracts – Paper Sessions

Hatice Gunes – Analysis of affect and personality for autonomous and telepresence robotics
University of Cambridge, UK

Computing that is sensitive to affective and social phenomena aims to equip devices, interfaces and robots with the means to interpret, understand, and respond to human personality, affect, moods and intentions - similarly to how humans rely on their senses to assess each other's affective and social behaviour. Designing robots with socio-emotional skills is a challenging task. The availability of commercial robots and developments in academia provide us a positive outlook, however, the capabilities of current social robots are still limited.
This talk will focus on automatic analysis of affect and perceived personality, and will present an overview of the recent work my team has conducted in these areas, in the context of human robot interactions for both autonomous and telepresence robotics.

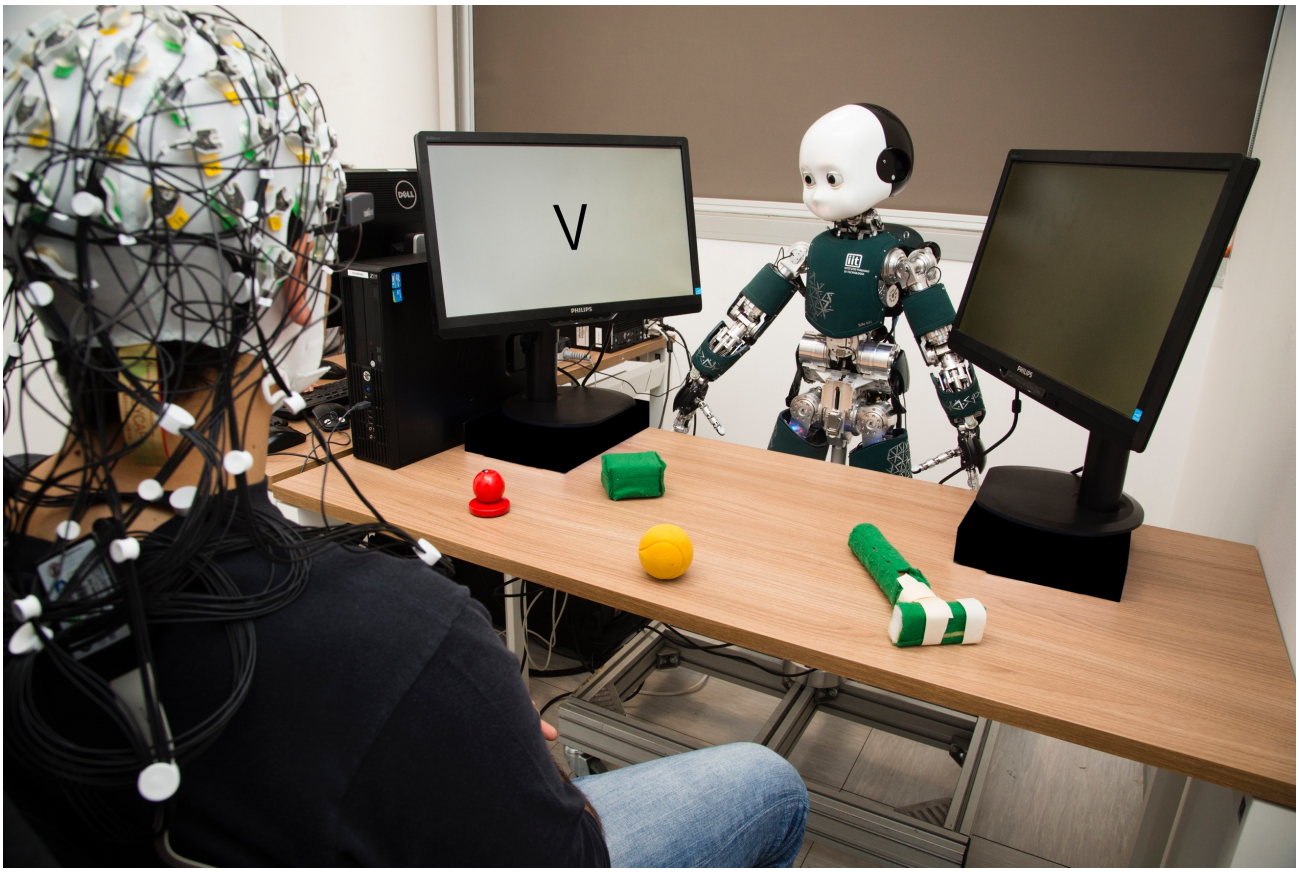
Fulvio Mastrogiovanni – Tactile maps for robots sensing and control
University of Genoa, Italy

In the past few years, research in physical human-robot interaction has been focused on providing robots with novel capabilities as far as the perception of the environment and the interaction with humans therein are concerned. Such challenges as coping with safety requirements and understanding human behaviour in real-time lead to the exploration of technological and scientific paradigms related to the use of large-scale tactile sensing, including the use of so-called robot skin. In this talk, I'll present some of the challenges we had to face when designing and deploying large-scale robot skin on humanoid robots, and I'll outline how insights from biology, computational neuroscience and classical knowledge representation inspired our work.

Abstracts – Paper Sessions

Agnieszka Wykowska – How attribution of intentionality to robots influences social attunement in human-robot interaction
Italian Institute of Technology, Italy

In our daily lives, we continuously engage in social interactions with others, and this is why the human brain has developed various mechanisms of social cognition, which allow to detect and convey social signals, and socially attune with others. Facing a new era, in which robots will be among us at our homes, offices and public places, we need to ask a question whether humans can also socially attune with artificial agents. In this talk I will focus on the mechanisms of social cognition underlying social attunement with humanoid robots. I will present results of studies in which we investigated various factors which play a role in social attunement, such as attributing intentionality to artificial agents, direct social presence, human-like behaviour. The talk will conclude with an outlook to the future – how results of such fundamental research can be used in design of robots that will be deployed into society – in healthcare, elderly care or daily assistance in domestic environments.



An example experimental protocol in our S4HRI lab at Istituto Italiano di Tecnologia (Genoa, Italy) with the use of cognitive neuroscience methods (EEG and mobile eyetracking) and the iCub robot in an HRI experiment.

Tom Ziemke– Intentions, intentionality and interactivity: Challenges for social robotics and social neuroscience

University of Skövde & Linköping University, Sweden

Research in the cognitive sciences, not least social neuroscience, has in recent years made substantial progress in elucidating the mechanisms underlying the recognition of actions and intentions in human social interactions - and in developing computational models of these mechanisms. However, there is much less research on the mechanisms underlying the human interpretation of the behaviour of artefacts, such as robots or automated vehicles, and the attribution of intentions to such systems.

Given the state of the art in the cognitive sciences, there are at least two very different intuitions that one might have: On the one hand, ever since Heider and Simmel's seminal psychological research on attribution 70 years ago, it is well known that people tend to interpret the movement of even very simple geometric shapes in terms of more or less human-like actions and intentions. This could be taken to point to the existence of universal schemata and mechanisms that are applied to any type of system that can be interpreted as an intentional 'agent', relatively independent of what that agent might look like. On the other hand, much social neuroscience research in recent decades, in particular the discovery of the mirror (neuron) system, seems to indicate that similarities and differences in embodiment/morphology might play a crucial role in the understanding of others' actions and intentions. This could be taken to indicate that humans might be able to understand the behavior of human-like robots more easily than, for example, the behavior of autonomous lawnmowers or automated vehicles.

The talk focuses on the role of intentions in human social interactions with different types of autonomous technologies, using examples from DREAM (www. dream2020.eu), a European project on the use of social robots in therapy for kids with autism, as well as comparative empirical research in progress on lay causal explanations of the behavior of humans vs. humanoids as well as regular vs. driverless cars.

Poster Session

Chaona Chen	University of Glasgow, *UK*	**Equipping social robots with socially and culturally sensitive dynamic facial expressions**
Aoife Fitzpatrick	Bangor University, *UK*	**Hand choice and the role of posterior parietal cortex**
Marco Gandolfo	Bangor University, *UK*	**Interactor's body/non-body shape does not affect visuo-motor interference effect during on-line motor coordination**
Felix Hekele	Bangor University, *UK*	**Do we emphasize with robots? Exploring perception of and interaction with artificial social agents.**
Anna Henschel	VU Amsterdam, *NL*	**Modulating the perception of other people's pain by stimulating the primary somatosensory cortex: a HD-TDCS and EEG study**
Ruud Hortensius	Bangor University, *UK*	**Automatic imitation during Human-Robot Interaction**
Te-Yi Hsieh	Bangor University, *UK*	**Interacting with a social robot: Which factors shape our reactions to nonhuman social agents?**
Eva Krumhuber	UCL, *UK*	**Mother Theresa or Terminator? Social stereotypes in the perception of artificial agents**
Eva Krumhuber	UCL, *UK*	**When do robots become more human-like? Mind attribution varies with the robot's functionality**
Aleksandra Kupferberg	University Hospital of Psychiatry University of Bern, *Switzerland*	**Fronto-parietal coding of intentional actions performed by artificial agents**
Haemy Lee Masson	KU Leuven, *Belgium*	**Human processing of social versus object-based touch and its implications for robotics**
Abhay Nayak	Independent Researcher, *India*	**A Primer on artificial consciousness**
Polly Shingler	Bangor University, *UK*	**Voluntary smiles increase perceived femininity: A comparison of human ratings and computational shape analysis**
Nicolas Spatola	Université Clermont Auvergne, *France*	**Social robots boost your cognitive performance**
Eduard Fosch Villaronga	University of Twente, *NL*	**HRI and the future of law**
Jon Walbrin	Bangor University, *UK*	**The visual perception of interactive behaviour in the posterior superior temporal cortex**
Elin Harding Williams	Bangor University, *UK*	**I like the way you move: Increased value of biological motion in individuals with few autistic traits**

Diolch am ddod a diolch am y gefnogaeth!

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