

# UK ROBOTICS SUMMER SCHOOL EDINBURGH

More information can be found at <https://ukrss.site.hw.ac.uk/>

Location: Heriot-Watt University  
The National Robotarium  
Date: 22<sup>nd</sup> - 26<sup>th</sup> June 2026

**Monday 22<sup>nd</sup> June – Bioinspired Robotics – The National Robotarium (Multi-flex Room)**

**08:30 – 09:00 Refreshments**

09:00 – 09:10 Introduction to Summer School, [Yvan Petillot, Heriot-Watt University](#)

09:10 – 10:30 Bioinspiration – why and how and research highlights, [Barbara Webb, University of Edinburgh](#)

**10:30 – 11:00 Refreshments**

11:00 – 12:30 Robot building workshop – connecting sensing to action, [Barbara Webb, University of Edinburgh](#)

**12:30 – 13:30 Lunch**

13:30 – 15:00 The robot zoo – surveying the landscape of bioinspiration, participants will present

**15:00 – 15:30 Refreshments**

15:30 – 16:30 Setting the landscape – AI in Assistive Autonomy, [Ram Ramamoorthy, University of Edinburgh](#)

## **Tuesday 23rd June - Healthcare and Robotics – The National Robotarium (Multi-flex Room)**

### **08:30 – 09:00 Refreshments**

09:00 – 09:45 Theory of mind: history, controversies and its utility in Human-Robot Interaction, [Thusha Rajendran, Heriot-Watt University](#).

Abstract: Here I will present a history of *Theory of Mind*: from its roots in Philosophy and Evolutionary, Comparative and Developmental Psychology – to its influence in Social Neuroscience. I will discuss how Theory of Mind has been used in Human-Robot Interaction (HRI). Specifically, I will argue that Theory of Mind is best utilised, not as an umbrella term, but when it is clearly specified. Hence, I will argue that in Theory of Mind can make a significant contribution to the field of HRI when operationalised correctly and with clarity about terminology, e.g. *Belief Attribution, Mentalising, Intentionality, Deception, Inferencing, Visual Perspective Taking*.

Bio: Gnanathusharan (Thusha) Rajendran is a Professor of Psychology at Heriot-Watt University and Director of the Developmental in Action Lab. He is interested in the social and decision-making process associated with the pre-frontal cortex like 'theory of mind' and 'executive functions' respectively. In Human-Robot Interaction (HRI) he investigates the human in the 'the-human-in-the-loop', and his research includes Trust in HRI, for example the relationship between trust and human likeness of robots in older adults; Socially Assistive Robotics (SAR) for individuals with developmental conditions like autism; and AI for Assistive Autonomy for people with dysexecutive problems in everyday tasks such a shopping and cooking.

09:45 – 10.30 Workshop – Accelerating Robotics Research Through Model-Based Design Mathworks, Rory Adams

Abstract: We will look at how MATLAB and Simulink are used to develop and test robotic systems, from early ideas through to design, implementation and deployment. We will introduce Model-Based Design as a workflow where engineers build a mathematical model of a system, explore its behaviour in simulation, and use that model to design and test algorithms and scenarios before running them on real hardware. Drawing on real industrial examples, we show how this approach helps teams work faster, identify issues earlier, and build more reliable robotic systems, particularly when physical testing is costly or risky. The session will also include hands-on activities to get started modelling and simulating 3D mechanical systems with Simscape Multibody, deriving inverse kinematics for motion and control algorithms for advance tasks.

Bio: Dr Rory Adams manages the UK Customer Success Engineering team at MathWorks. We partner with academics to help them achieve their research and teaching goals through the effective use of the full capabilities of MATLAB and Simulink. Rory has extensive experience, as former Application Engineer and Consultant at MathWorks, providing technical guidance and delivering tailored solutions to commercial customers, across a diverse range of industries. He brings a wealth of expertise and a deep understanding of engineering industry and academic needs to his current role.

### **10:30 – 11:00 Refreshments**

11.00- 12.30 Workshop – Mathworks (cont)

### **12:30 – 13:30 Lunch**

13.30 – 14.00 Text-to-Image Diffusion Models in Healthcare Applications, [Robert Cronshaw](#) and [Konstantinos Vilouras, University of Edinburgh](#)

**Abstract:** Text-to-image diffusion models have emerged as powerful generative models for learning from large-scale medical imaging datasets. This raises an important question: what clinical knowledge do these models learn, and how can we determine whether that knowledge is represented faithfully? In the first part of this talk, we discuss medical phrase grounding, the task of linking findings described in radiology reports to their corresponding image regions. Early phrase grounding approaches relied on costly expert annotations of pathology locations. Instead, we show that pre-trained text-to-image diffusion models implicitly learn spatially meaningful representations that can be used for phrase grounding, despite never being trained explicitly for this task. We further discuss how weak supervision extracted from unstructured radiology reports can improve localisation performance without requiring additional manual annotations. In the second part, we examine the challenge of evaluating text-to-image generative models. While synthetic medical images may appear realistic, visual quality alone does not guarantee that the generated findings match the intended clinical description. Existing metrics such as FID and CLIP primarily measure realism and semantic similarity, but provide limited insight into clinical correctness. We present CSEval, an evaluation framework that assesses whether generated images faithfully reflect the clinical content of a prompt. The framework converts generated images back into reports, extracts clinical entities, and compares them with the original prompt. Across 310 chest X-rays, CSEval was the only automatic metric that matched radiologist rankings. Together, these studies illustrate two complementary perspectives on diffusion models: understanding where clinical concepts are represented within the model and evaluating whether those concepts are faithfully reproduced in generated images.

**Bio:** Konstantinos Vilouras is a PhD student at University of Edinburgh, supervised by Professor Sotirios Tsaftaris and Dr Alison O'Neil. His research interests include multimodal learning, foundation models and data-efficient deep learning for medical imaging applications. He holds a Master's degree in Data Science and Machine Learning from National Technical University of Athens and a Diploma in Electrical and Computer Engineering from the Aristotle University of Thessaloniki.

**Bio:** Robert Cronshaw is an ECAT PhD student at the University of Edinburgh supervised by Professor Sotirios Tsaftaris, Dr Steven McDonagh, and Dr Ewen Harrison. He is also a radiologist and Fellow of the Royal College of Radiology. His research interests include selecting approaches with the right inductive bias for solving medical imaging problems and integrating agents into healthcare.

14.00 – 14.30 Empowering Independent Living through Robotics, IoT and User Ownership  
[Mauro Dragone, Heriot-Watt University](#)

**Abstract:** Advances in robotics, artificial intelligence, and the Internet of Things are transforming the way we think about health, wellbeing, and independent living. By combining smart environments with autonomous and interactive robots, Ambient Assisted Living (AAL) systems can provide personalised support, enhance safety, and help people remain independent for longer. In this talk I will discuss the potential of this new class of AAL systems, but also the obstacles and concerns that still hinder the take-up and use of the underpinning technologies. Attention will be given to a range of research projects in which end-users play a central role, not simply as participants in design activities but as active stakeholders and owners of the technology itself. The talk will explore how this shift towards user empowerment can improve acceptance, trust, and long-term sustainability, while opening new directions for research and innovation in assistive and social robotics."

**Bio:** Dr Mauro Dragone is Associate Professor in the School of Engineering and Physical Science at Heriot-Watt University. Dr. Dragone has worked in EU projects in the area of Internet of Things (IoT) for smart environments, before leading the EU project RUBICON (Robotic Ubiquitous Cognitive Network, 2011-2014), a 2.5 million EUR project that has posed the

foundations for self-adaptive robotic systems for Ambient Assisted Living (AAL) applications. At Heriot-Watt, Dr. Dragone set up a 'Living Lab' designed to facilitate user-driven design and testing of innovative and more practical solutions for healthy ageing and independent living. He has been involved in EU coordination actions developing new benchmarks for assistive robots and was one of the co-investigators of the EPSRC Healthcare NetworkPlus EMERGENCE, developing the UK roadmap for assistive robotics for frailty. His current research activities include cloud-robotics, tele-presence robotics, and integration of robot technology in smart homes to assess and assist people living with conditions such as dementia and frailty.

14.30 – 15.00 Talk: From ideation to medical translation: the role of the Medical Device Manufacturing Centre for academics and companies. [Marc Desmulliez, Heriot-Watt University](#)

Abstract: The Medical Device Manufacturing Centre headquartered at Heriot-Watt in partnership with the universities of Edinburgh, Glasgow, Dundee and Robert Gordon, and backed by Scottish Enterprise, has supported more than 178 Scottish medical device companies since 2020 and facilitated around £30M of investment since 2023. For many of those firms, often small businesses with compelling technology but limited resources, access to prototyping facilities, manufacturing expertise and regulatory guidance has been the difference between staying stuck at concept stage and becoming genuinely investable. The talk will present how academics and companies can access the range of facilities of the MDMC.

Bio: Prof. Marc Desmulliez, FRSE, FInstP, FIET, is former Associate Principal for impact, founder and manager of the £12M Medical Device Manufacturing Centre ([www.mdmc.ac.uk](http://www.mdmc.ac.uk)) headquartered at Heriot-Watt University, Edinburgh, Scotland, UK. Marc has held grants of compounded value of more than £52M as Lead or co-Lead, published over 532 journal papers or conference proceedings articles, and holds 10 patents and 3 Design Rights. He span out Microstencil Ltd in 2003, a spin-out company specialized in flip-chip bonding technology using stencil printing. The technology was transferred to DEK in 2011 and now is used in all mobile phones in the world. His second company, Microsense Technologies Ltd, aims at non-destructive testing using microwave sensing. This initiative got him the shared £90K first prize in the Converge Challenge 2016, arguably the most prestigious entrepreneurship award in Scotland. His research interests include medical devices, microwave sensing and bio-inspired manufacturing, more precisely the understanding and translation of natural processes to manufacturing principles, an arguably new topic of research in engineering.

### **15:00 – 15:30 Refreshments**

15.30 – 17.00 Immersive Suite Tour - Hazel Matthews, Heriot-Watt University

17.00 – 17.30 Panel/Interactive session “How do you start a PhD in Healthcare Robotics?”

Panelists: Senior academics (All speakers ), Late-stage PhD / postdoc

Topics of discussion:

- How to choose a clinically relevant problem?
- How early should you talk to clinicians?
- What makes experiments publishable?
- Common mistakes in Year 1

**19:00 Summer School Dinner at the [Doric Tavern Edinburgh](#) (meet there)**

**Wednesday 24<sup>th</sup> June - Generative AI for Robotics –The National Robotarium (Multi-flex Room)**

**08:30 – 09:00 Refreshments**

09:00 – 09:45 Generative AI for robotics – an introduction [Oliver Lemon, Heriot-Watt University](#)

- Safety of embodied AI, multi-agent collaborative AI
- Case study – the SPRING project

9.45-10.30 Speech technology for robots [Matthew Aylett, Heriot-Watt University](#)

**10:30 – 11:00 Refreshments**

**11:00 – 12:30** Fundamentals of Generative AI, [Alessandro Suglia, University of Edinburgh](#)

**12:30 -13:30 Lunch**

13:30 – 15:00 Practical session on embodied AI with LLMs [Oliver Lemon, Heriot-Watt University](#) and [Alessandro Suglia, University of Edinburgh](#)

**15:00 – 15:30 Refreshments**

15:30 – 16:30 Invited talk, Generative AI for Robotics at Google Deepmind; Gemini Robotics - [Abhishek Jindal, Google DeepMind](#)

16:30 – 17:30 Invited talk, [Kevin Black, Physical Intelligence](#)

## Thursday 25<sup>th</sup> June - Safe AI for Robotics - The National Robotarium (Multi-flex Room)

### 8:30 – 09:00 Refreshments

9:00 – 9:30 Introduction to Safe AI methods Autonomous Systems. [Ekaterina Komendantskaya, University of Southampton / Heriot-Watt University](#)

9:30 – 10:30 Verification of Neural networks with Vehicle [Ekaterina Komendantskaya, University of Southampton / Heriot-Watt University](#)

### 10:30 – 11:00 Refreshments

11:00 – 11:30 Training Neural networks to be safe, [Ekaterina Komendantskaya, University of Southampton / Heriot-Watt University](#)

11:30 – 12:30 Verification of Medical Devices: an in-depth case study. [Alistair Sirman, Southampton University](#) and [Jessica Ciupa, Heriot-Watt University](#)

### 12:30 – 13:30 Lunch

13:30 to 15:00 Labs and tutorials: Verify your first neural network – EM250 - Linux Lab

### 15:00 – 15:30 Refreshments

15:30 – 17:00 Labs and tutorials: Full Safe AI cycle for medical devices – EM250 - Linux Lab

## Friday 26 June – Applications Day – The National Robotarium (Multi-flex Room)

### 08:30 – 09:00 Refreshments

9.00 – 09:45 Applications – Towards Autonomous Robots for Marine operations [Yvan Petillot, Heriot-Watt University](#)

Abstract: In this talk, I will explain why robots are needed for marine operations and how recent developments in AI, Control, and highly parallel simulations are paving the way for their adoption. I will show that modern learning approaches, when combined with powerful simulation tools, enable the development of robust sensing, control, and autonomy solutions. Combined they provide a powerful set of tools to make autonomous marine operations a reality.

09:45 -10:30 Applications – Towards Robot Motor Intelligence: The Evolution of Whole-Body Control in Legged Robots [Carlos Mastalli, Heriot-Watt University](#)

Abstract: Legged robots have evolved from executing carefully designed walking motions to performing increasingly dynamic locomotion and manipulation tasks in complex and uncertain environments. This lecture will present this evolution through the lens of whole-body control, showing how progress in modeling, state estimation, system identification, simulation, and numerical optimization has enabled robots to coordinate many degrees of freedom while reasoning about contacts, dynamics, and task objectives. We will discuss key ideas behind optimization-based control, model predictive control, differential dynamic programming, and contact-aware motion generation, with examples connected to open-source tools and research efforts such as Crocoddyl, ODYN, and Genesys. The lecture will conclude by introducing the broader vision of Robot Motor Intelligence (<https://www.romilab.org/>): the integration of physics-based models, efficient optimization, simulation, estimation, and learning into unified architectures for adaptive and versatile legged and humanoid

### 10:30 - 11.00 Refreshments

11:00 - 11.30 [Jonatan Scharff Willners](#), Frontier Robotics. From research to commercialisation of subsea robotics.

Abstract: Frontier Robotics is a UK-based marine technology company developing advanced subsea autonomy and intelligent perception systems that transform underwater operations. Its vendor neutral, interoperable software and sensing technologies enhance the performance, safety, and efficiency of underwater robot operators across sectors including offshore energy, defence, aquaculture, and maritime infrastructure. Founded in 2023, the company delivers intelligent, real time autonomy, imaging, and underwater inspection capabilities that enable safer, smarter, and more scalable subsea operations globally. "

11:30 – 12:00 [Daniela Shchegelskaya](#), Elimpus. Trusting Robots at a Distance: Acting on Data You Cannot Fully See.

Abstract: When robots inspect critical infrastructure, the operator often acts on what the robot shows them without ever setting foot on site. The hard question is no longer whether the robot works, but whether the data can be trusted enough to act on. Drawing on her experience deploying Boston Dynamics Spot to inspect live power substations, Daniela will explore the realities of remote diagnostics: why video and sensor data can mislead at a distance, how to combine and cross-check different sources to judge what is reliable, and when a fault can be flagged remotely versus when a human still needs to go on site. Students will see that remote operation is as much a human and decision-making problem as a technical one, and will gain insight into the engineering choices that let operators act safely on data they cannot fully see.

12:00 – 12:30 [Matthew Nancekievill](#), Ice9 Robotics. Safer Nuclear Characterisation through Robotics

Abstract: Robotic systems are transforming work in nuclear environments by enabling inspection, maintenance and characterisation in areas that are hazardous or inaccessible to people. This presentation explores example deployments by Ice9 Robotics, key technologies, benefits, and the transition from the lab to industry.

### **12.30 – 13.30 Lunch**

13:30 - 14:00 The UK-RAS Network; an overview of activities and opportunity to engage, [Andy Weightman, University of Manchester](#)

14:00 – 15:00 Exhibits and demonstrations and a Tour of the National Robotarium.

**15:00 Close**