HEART

Human-cEntred AI and Robotics for Assistive and Rehabilitative Technology towards Good Health and Well-being

UK-Thai Health Alliance

Research Talk Symposium

21 August 2025

Organised by

University of BRISTOL

VISTEC
VIDYASIRIMEDHI
INSTITUTE OF SCIENCE AND TECHNOLOGY

Sponsored by

The Academy of Medical Sciences

Networking Grants

Overview

UK-Thai Health Alliance: Advancing Assistive and Rehabilitative Technology with Human-Centred Robotics and AI for Good Health and Well-being

Over 4 million people are experiencing physical disabilities in Thailand with the majority suffering from mobility impairments. The main causes are ageing-related muscle weakness, stroke, brain or spinal cord injuries due to road traffic accidents, and traumas from heavy manual work. Disability in Thailand leads to loss of work, poverty and living dependence. Medical treatments, rehabilitation facilities, and access to assistive devices are limited disproportionately in the rural and poorer communities where over 95% of disabled people in Thailand live. These combined factors result in unsustainable and unmet welfare and significantly reduced living quality of people with disabilities.

This UK-Thailand networking program aims to foster UK-Thailand collaboration and networking across multidisciplinary research groups to address the present healthcare needs in Thailand. Within this program we have brought together healthcare leaders from multidisciplinary expertise, including advanced soft robotics for comfortable medical devices, artificial intelligence for intelligent human-centred control, and specialists in physiotherapy and sports science. Our mission is to identify groundbreaking solutions to pressing healthcare challenges and stimulate technology advancement in both the UK and Thailand and lay the groundwork for a strong UK-Thai partnership to pursue larger collaborative research while expanding across European and Asian continents.

The collaborative team includes the VIVO Healthcare Technologies Hub, University of Bristol (UoB), UK, Vidyasirimedhi Institute of Science and Technology (VISTEC), Thailand, and Chulalongkorn University, Thailand. This program is sponsored by the Academy of Medical Sciences through the Networking Grant and led by Professor Poramate Manoonpong (VISTEC) and Dr Richard Suphapol Diteesawat (UoB).

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HEART towards Good Health and Well-being

21 Aug 2025 | 9 AM 5 PM | Bristol Robotics Laboratory

Speakers:

Prof. Jonathan Rossiter
University of Bristol

Dr. Martin Garrad
University of Bristol

Dr. Emanuele Pulvirenti
University of Bristol

Dr. Richard S. Diteesawat
University of Bristol

Sergio D. S. Marín
University of the West of England

Prof. Giacinto Barresi
University of the West of England

Dr. Maziar Ahmad Sharbafi
Technical University of Darmstadt

Dr. Bruno Grandi Sgambato
Imperial College London

Dr. Arjan Buis
University of Strathclyde

Dr. Tommaso Proietti
Scuola Superiore Sant'Anna

Dr. Chaicharn Akkawutvanich
VISTEC

Dr. Telmo de Menezes e Silva Filho
University of Bristol

Prof. Poramate Manoonpong
VISTEC

SCAN TO REGISTER

Agenda:

9:00 - 9:15 — **Welcome & Introduction**
Prof. Rossiter

9:15 - 10:45 — **Topic 1: Exoskeletons**
- Soft Wearable Robots that work with the body and the brain — Dr. Garrad
- To still boldly go, and stay: soft exosuits for astronauts' health maintenance and on-Earth rehabilitation — Dr. Pulvirenti
- (BILO): A Futuristic Approach for Cognitive-Driven Assistance — Dr. Ahmad Sharbafi
- Soft Wearable Robotics for Assistance, Restoration and Augmentation — Dr. Proietti

10:45- 11:15 — **Coffee Break**

11:15- 12:15 — **Topic 2: Ergonomics and Wearable Technologies**
- Human Factors Research on Robotic-Digital Systems for Healthcare — Prof. Barresi
- Human Interfacing in Rehabilitation and Augmentation Technologies — Dr. Grandi Sgambato

12:15- 13:30 — **Lunch**

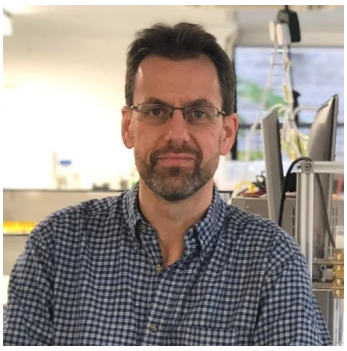
13:30- 15:00 — **Topic 3: Human - Robot Interactions**
- Body-Device Interface Interactions- reasons you should know about mechanobiology — Dr. Buis
- Human-in-the-Loop AI for Wearable Robots: Enhancing Interaction and Rehabilitation — Mr. Sergio David Sierra Marín
- Training ML Models for Human-Robot Interaction: Sparse Labelled Data and Privacy Concerns — Dr. de Menezes e Silva Filho

15:00- 15:20 — **Coffee Break**

15:20- 16:20 — **Topic 4: AI and Machine Learning for Control**
- Embodied Intelligence in Soft Robotics: From Morphological to Neural Computation — Prof. Manoonpong
- Healthcare 4.0 - Neural Multimodal Control of a Lower-limb Exoskeleton for Automated Rehabilitation — Dr. Akkawutvanich

16:20- 17:00 — Closing & Reflection

Topic 1 – Exoskeletons
09:15 - 10:45



Professor Jonathan Rossiter
University of Bristol, UK

Jonathan Rossiter is Professor of Robotics at the University of Bristol and Bristol Robotics Laboratory, and Royal Academy of Engineering Chair in Emerging Technologies. He is an innovator of smart materials and soft robotics. Jonathan leads the VIVO Hub EPSRC Programme Grant for Enhanced Independent Living.

Introduction & Welcome
A future where people with disabilities and older people are restored to full mobility and health through robotic technologies. We will review the latest progress in fundamental technologies for function restoration developed at the University of Bristol's SoftLab.

Dr. Martin Garrad
University of Bristol, UK

Martin Garrad, based in the Soft Robotics group at Bristol Robotics Laboratory, researches intelligent soft robots that safely interact with people, with a focus on control and actuation technologies.

Soft Wearable Robots that work with the Body and the Brain

Dr. Emanuele Pulvirenti
University of Bristol, UK

Emanuele Pulvirenti, Research Associate in the SoftLab, developing soft exosuits and functional garments to protect muscular and bone health in astronauts and on Earth. His collaborations include industry, academia, and government, with applications ranging from future spacesuits to rehabilitation.

To still boldly go, and stay: soft exosuits for astronauts' health maintenance and on-Earth rehabilitation.
Soft exosuits are a safe, affordable, accessible, and effective technology with the potential to improve people's lives by supporting musculoskeletal health and rehabilitation both in Space and here on Earth. In the future, they will allow humans to live a long and healthy life wherever in the universe they might be.

Dr. Maziar Ahmad Sharbafi
Technical University of Darmstadt, Germany

Dr. Maziar Sharbafi is a control engineer specializing in biomechanics, robotics, and assistive technologies. With over 90 publications and dual PhDs in Control Engineering and Biomechanics, he leads the Locomotion Control Assistance group at TU Darmstadt. His research integrates biomechanics, neuroscience, and robotics to advance bioinspired locomotion control and intelligent assistive devices, now also exploring machine learning and cognitive-driven assistance.

BRAIN IN THE LOOP OPTIMIZATION (BILO): A Futuristic Approach for Cognitive-Driven Assistance
Despite significant progress in assistive technologies, a major challenge remains: what should be optimized to adapt assistance to individual users? The cost function that best represents human needs—such as effort, comfort, or cognitive demand—remains unclear. In this talk, we explore this question and introduce Brain-in-the-Loop Optimization (BILO) as a futuristic approach to address it. By leveraging brain signals, BILO aims to capture user preferences implicitly and enable intelligent, personalized adaptation of assistive systems with minimal user effort.

Dr. Tommaso Proietti
Sant' Anna Institute, Italy

Tommaso Proietti is an Assistant Professor at the Scuola Superiore Sant'Anna, leading the Soft NeuroBionics Lab. His research focuses on wearable robotics for functional assistance and neurorehabilitation, combining soft actuators, sensor-based control, human–robot interaction, and clinical validation, from proof-of-concept to translational applications.

Soft Wearable Robotics for Assistance, Restoration and Augmentation
The Soft NeuroBionics Lab develops soft wearable robotic systems for functional assistance and neurorehabilitation of patients with neurological conditions. Our work combines sensor-based control, human–robot interaction, and clinical validation to advance modular exosuits and soft neurotechnologies from proof-of-concept to translational applications.

Topic 2 – Cognitive ergonomics and wearable technologies
11:15 - 12:15

Professor Giacinto Barresi
University of the West of England, UK

Giacinto Barresi, with a PhD in Robotics and a MSc in Psychology and Neuroscience, is a Professor at Bristol Robotics Laboratory, UWE Bristol. He focuses on cognitive and neuroergonomic approaches to assistive, prosthetic, rehabilitative, and surgical technologies. He holds leadership roles in UK-RAS, the International Ergonomics Association, and IEEE initiatives, and has held research and teaching positions in Italy, India, and Japan.

Human Factors Research on Robotic-Digital Systems for Healthcare
Robotic-digital systems for healthcare applications can (and must) leverage the knowledge and know-how offered by the interdisciplinary domains of human factors. By aligning the device features with the users' capabilities and needs, this effort can lead to truly human-centred solutions to enhance the human well-being and performance.

Dr. Bruno Grandi Sgambato
Imperial College London, UK

Bruno Grandi Sgambato is a biomedical researcher at Imperial College London, specializing in human–machine interfaces. His work explores new sensors and processing methods for improved communication between humans and machines, including applications in ultrasound-based motor unit analysis, prosthetics, exoskeletons, and virtual reality. He holds a BSc in Physics from the University of Campinas and is a PhD in biomedical engineering from Imperial, contributing to projects like SOMA and the VIVO Hub.

Human Interfacing in Rehabilitation and Augmentation Technologies
Robust, high-bandwidth interfaces are critical to enable the evermore complex rehabilitation and augmentation systems being developed. Instead of directly connecting to the brain, interfaces can be built by recording signals from the periphery. We will cover a range on sensing, processing methods and machine learning approaches that have been used to enable the next generation of interfaces.

Topic 3 – Human-robot interaction
13:30 - 15:00

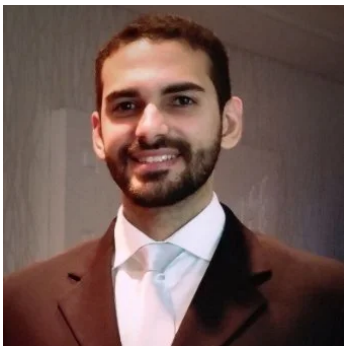
Dr. Arjan Buis
University of Strathclyde, UK

Dr. Arjan Buis leads a leading multi-disciplinary research group that specialises in the development and delivery of next generation Assistive and Adaptive Rehabilitation Technologies (AaRT) including prosthetics, orthotics and soft robotics. Using advanced technology for biomechanical assessments the research group focus on advancing our understanding of the complexity of biomechanical mechanisms that contribute to the generation and control of load transfer forces. In addition, the research group develop the technology to integrate these biomechanical mechanisms into neural interfaces with the prosthetic/ Orthotic field.
BODY-DEVICE INTERFACE INTERACTIONS - reasons you should know about mechanobiology

Mr. Sergio David Sierra Marín
University of the West of England, UK

Sergio David Sierra Marín is a biomedical engineer and currently a PhD student in the EPSRC Centre for Doctoral Training in Future Autonomous Robotic Systems (FARSCOPE) programme. He is interested in working with control strategies for robotics, machine learning, rehabilitation, and artificial intelligence.

Human-in-the-Loop AI for Wearable Robots: Enhancing Interaction and Rehabilitation



Dr. Telmo de Menezes e Silva Filho
University of Bristol, UK

Telmo Silva Filho is a Senior Lecturer in Data Science at the University of Bristol (UoB). He has more than 15 years of experience in Machine Learning (ML) research, with a track record in model evaluation, probability calibration, and explainability, and a particular focus on applications of ML in digital health. He is currently a work package lead in the EPSRC TORUS Programme and in the VIVO hub, developing ML models for in-home monitoring and human activity recognition for Parkinson's patients and people with reduced mobility. He is also Research Director in the UKRI Centre for Doctoral Training in Practice-Oriented Artificial Intelligence.

Training ML Models for Human-Robot Interaction: Sparse Labelled Data and Privacy Concerns
Training models for in-home monitoring and Human-Robot interaction is an area of research that has attracted strong interest, given the world's growing elderly population. Models for this task tend to be built on several different data modalities, especially RGB video and wearable data. This raises privacy concerns as by transferring user data to a central server, personal information would be vulnerable to exposure. Federated learning was proposed as a solution to this: user data never leaves their premises/devices and only model weights are communicated. However, real-world federated learning faces two key challenges: limited access to labelled data and the presence of heterogeneous multi-modal inputs. Thus, we propose

TACTFL, a unified framework for semi-supervised multi-modal federated learning. TACTFL introduces a novel temporal contrastive training scheme that learns modality-agnostic representations from unlabelled client data by leveraging temporal alignment across modalities. However, as clients perform self-supervised training on heterogeneous data, local models may diverge semantically. To mitigate this, TACTFL incorporates a similarity-guided model aggregation strategy that dynamically weights client models based on their representational consistency, promoting global alignment. Extensive experiments across diverse benchmarks and modalities, including video, audio, and wearable sensors, demonstrate that TACTFL achieves state-of-the-art performance. This talk will present TACTFL, discuss results, and introduce new challenges for future work.

Topic 4 – Embodied artificial intelligence and machine learning for adaptive exoskeleton control
15:20 - 16:20

Professor Poramate Manoonpong
VISTEC, Thailand

Poramate Manoonpong is a Professor at VISTEC, Thailand, and Biorobotics Professor at the University of Southern Denmark. He has published over 120 papers and led more than 10 funded projects, including EU Horizon 2020 and Marie Skłodowska-Curie Actions. His research focuses on bio-inspired robots with neural control and learning, translating biomechanics and brain-like mechanisms into real-world applications in healthcare, industry, and service. He serves as associate editor for multiple journals, and his work has been featured in major outlets including IEEE Spectrum and Nature Machine Intelligence.

Embodied Intelligence in Soft Robotics: From Morphological to Neural Computation
Soft-bodied crawling animals exhibit adaptive, emergent behaviors resulting from the synergy between morphological computation (e.g., a flexible soft body and anisotropic skin) and neural computation (e.g., neural control with synaptic

plasticity and memory). However, realizing this synergy in robots remains challenging.

Our embodied neural control approach that integrates a flexible soft-body structure with asymmetrical abdominal denticles and an adaptive neural control system. The body structure, capable of micro- and macro-deformation, facilitates passive adaptation (achieved through morphological computation), while the adaptive neural control system generates locomotion patterns and enables online learning for active adaptation (achieved through neural computation). This two-level adaptation strategy allows a simple soft robot to passively adapt its body to small perturbations and actively adapt its control in response to larger perturbations. Our approach provides a possible option toward achieving embodied intelligence in soft robotics.

Dr. Chaicharn Akkawutvanich
VISTEC, Thailand

Chaicharn Akkawutvanich earned his PhD from VISTEC, Thailand, developing adaptive exoskeleton systems to improve human walking and advance bio-inspired locomotion control. He holds degrees in Electrical Engineering (Chulalongkorn University) and Biomedical Engineering (RWTH Aachen), with research spanning bioelectronics, medical imaging, and human–machine interaction. His career also includes roles in the petrochemical industry, data mining, and customer service management at Siemens Healthcare.

Healthcare 4.0 - Neural Multimodal Control of a Lower-limb Exoskeleton for Automated Rehabilitation
To fulfil for the forthcoming healthcare generation (Healthcare 5.0) focusing on human-robot interaction and personalization, the current rehabilitation platform should be firmly prepared and transformed into the automated process (Healthcare 4.0) capable of sensing human information and adapting its essential components to various human activities. In our scope, we present the system integration of gait rehabilitation platform where equipment from different manufacturers do automatic communication and synergy. Demonstrating through this automated gait

lab platform, the novel online adaptive neural control algorithm enables a wearable assistive device as a lower-limb exoskeleton to perform multiple human activities with his/her own individual locomotion pattern. The algorithm allows us to do online learning and perform assistive action within a short period of time and with smooth transition. Moreover, extra movement sensors are added to enhance human activity recognition via our developed attention-based deep learning network which can automatically classify feedback and synchronize command signal to the automated gait lab platform for early environment preparation.

Program Organiser

Dr. Richard Suphapol Diteesawat
University of Bristol, UK

Richard Suphapol Diteesawat is Senior Research Associate and Researcher Co-investigator of the VIVO Healthcare Technologies Hub project at University of Bristol. He has developed deep expertise and a strong passion for medical assistive robots. His work spans mobility rehabilitation for elderly individuals and patients with disabilities, including stroke, spinal cord, and brain injuries, as well as body augmentation for able-bodied users in industrial and space applications. His research focus covers soft robotics, smart materials, intelligent textiles and advanced wearable and medical rehabilitation technologies.

Acknowledgement

We gratefully acknowledge the VIVO Hub management team, especially Mia Hill, for their valuable support, as well as the VIVO Hub project facility and Bristol Robotics Laboratory. We would also like to thank Matas Manawakul (VISTEC) and Sue Newby (UoB) for their help in organising the event.