

SEMINAIRE SCIENTIFIQUE – ECOLE DOCTORALE MEGA

Vendredi 12 avril 2019 de 14h à 15h

IFSTTAR - Salle Jules Verne, Cité des Mobilités - Bron

Professeur David Lloyd, PhD FISB

Professor of Biomechanical Engineering, Menzies Health Institute Queensland

Developing Assistive Devices to Optimise Neural and Musculoskeletal Rehabilitation

Abstract:

The nervous system and musculoskeletal tissues will repair or degrade based upon their functional neurophysiological and mechanobiological niches. These niches are the result of personalised efferent and afferent neural excitation patterns that are functionally consistent with the individual's musculoskeletal motion and loading, and their musculoskeletal tissues' morphology, strain and mechanobiology. To optimally promote repair of musculoskeletal tissues their "ideal" in vivo tissue strains must be attained, which can be facilitated using real-time afferent biofeedback and/or movement assistance during the patient's rehabilitation. Nervous system rehabilitation requires the patient to perform desired rehabilitation movements that are coupled with functionally consistent muscle excitation (e.g. functional electrical stimulation) and afferent biofeedback. In both rehabilitation scenarios, movement assistance, muscle excitation and/or afferent biofeedback can be achieved via innovative and personalised wearable devices that are enabled by personalised digital twins of the patient. Personalised digital twins are multiscale neuromusculoskeletal rigid body and finite element models, and/or their AI equivalent models, that can operate in real-time. This talk will examine how this can be achieved, with examples provided.

Biography:

David Lloyd is a Professor of Biomechanical Engineering in the School of Allied Health Sciences and director of the [Gold Coast Centre for Orthopaedic Research, Engineering and Education](#) (GCORE) in the Menzies Health Institute Queensland. GCORE is an alliance between Griffith University, the Gold Coast University Hospital and other hospitals on the Gold Coast and in Brisbane. David was also co-founder of and a Professor in Griffith's new [Advanced Design and Prototyping Technologies Institute](#) (ADaPT), leading the medical devices domain. He is mechanical engineer who first worked in the aeronautical industry, but then completed a PhD and post-doctoral training in biomechanical engineering and neurophysiology. After a long career in biomechanical engineering he is now an elected Fellow of the International Society of Biomechanics. David and team have developed computer-simulation methods to study the causes, prevention, management and rehabilitation of neuromusculoskeletal conditions, with these methods now being adopted in the orthopaedics and neurorehabilitation industries. David and team are currently developing accurate personalised digital models of humans with real-time capabilities by combining data from laboratory-based instrumentation, multimodal medical imaging and wireless wearable devices. David and team work with hospitals, and sporting organisations, and medical imaging, orthopaedic, and wearable device companies. He has more than 200 scientific journal papers, over 12,350 citations and H index of 56 (Google Scholar) and attracted over \$AUD23Million in R&D funding.

