Biomechanics/ Engineering Mechanics (Reg. No. 2019)

Type of position Full PhD study: 48 months		**Main supervisor** Ruoli Wang
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Specific subject area(s)
Biomechanics, 2D/3D ultrasound, muscle electromyography, musculoskeletal modeling, human movement

Title of project
Integration of HD-EMG, 2D/3D ultrasound and musculoskeletal modeling for the assessment of *in vivo* neurophysiology and mechanical function coupling of human muscles

Number of available positions
1

Earliest start date
September 2020

Project website
https://www.kth.se/en/sci/kth-moveability-lab

Short description of the project
Up to 1 billion people worldwide suffer from various neurological disorders. Impaired motor function is one of the major results of a malfunctioning nervous system, wherein patients may lose their ability to perform daily activities. The neurological originated disorders are often accompanied with the secondary, non-neurological impairments in muscle tissues. Human musculoskeletal function is accomplished via neural control of muscle contractions that generate interaction forces throughout the skeletal system. Conventionally, muscle activation and the muscle tissue structure are investigated using surface electromyography (EMG) and ultrasound (US), respectively. Surface EMG, especially high-density surface EMG (HD-EMG) provides a high spatio-temporal resolution of the muscle electrophysiological events during the movement. 2D US samples images allows quantifying muscle structure parameters and displacement during muscle contractions. 3D US can overcome the limited view of a 2D US transducer by adding a pose sensor to the US transducers, which results in a volumetric data set of the muscle anatomy. Combining HD-EMG and 2D/3D US has the great potential to provide a detailed description of muscle function, from the neural excitation to the resulting muscle tissue structure and force production capacity. This innovative approach can contribute to the investigation of muscle physiology, to inform personalized musculoskeletal model, to facilitate human-machine design and to the assessment of rehabilitation interventions. The applicant will be expected to be involved in experimental methodology development, data collection, and computationally simulations. Experience with medical imaging and biological signal post-processing are required. Basic knowledge about biomechanics of human movement is desired.