

## IMAGE-BASED MULTISCALE MODELLING OF COLLAGENOUS SOFT TISSUES

DANIELA VALDEZ-JASSO <sup>1</sup>, GEORGES LIMBERT <sup>2,3</sup>

<sup>1</sup> University of Illinois at Chicago, USA

Email: dvj@uic.edu

<sup>2</sup> University of Southampton, UK; <sup>3</sup> University of Cape Town, South Africa

Email: g.limbert@soton.ac.uk

**Key words:** Soft-tissue mechanics, multi-scale modelling, structure, characterisation, imaging

### ABSTRACT

#### Motivation

Collagen fibres are the main constituents that provide structural support for organ functions. The multiscale organisation of these fibres is intimately related to tissue mechanics and is known to be strongly modulated by pathologies and in ageing. Therefore, to characterise the mechanical behaviour of biological soft tissues it is crucial to consider and incorporate into mathematical models the microstructural architecture of collagen assemblies. A wide variety of image modalities are used in the biomechanics field and can provide high fidelity measurements at the scale of fibres and sub-fibrils. However, the incorporation of this type of data and measurements—which span multiple length and temporal scales—into constitutive equations is not a trivial task. To develop truly multi-scale models of collagenous tissues, it is therefore of prime importance to bridge the gap between imaging modalities and modelling techniques.

#### Focus of the mini-symposium

The purpose of this mini-symposium is to bring together researchers in the field to discuss the advancements and challenges when combining fibre structure/architecture with tissue and organ level mechanics. In particular, the mini-symposium will focus on the different data acquisition imaging modalities and how they are incorporated into multi-scale mathematical and computational frameworks. The goal is to present state-of-the-art research in this field and identify current and future challenges.