Cardiovascular, Cerebrovascular and Orthopaedic diseases: Imaging and Modelling

Thematic Session within VipIMAGE 2019

VII ECCOMAS Thematic Conference on Computational Vision and Medical Image Processing

Porto, Portugal, 16-18 October 2019

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Description

Patient-specific modelling and simulations for describing mechanisms associated to diseases are important in clinical practice as guidelines for diagnosis and surgical interventions.

Cardiovascular and cerebrovascular diseases have been one of the main causes of mortality in developed countries. Atherosclerosis occurs due to the accumulation of lipoproteins and other fat substances inside the arterial wall leading to plaque formation. Clinical practice has shown that specific sites in the human circulatory system are more propitious to plaque development. When the progression of atherosclerotic lesion exceeds the compensatory wall response, plaques protrudes into the lumen causing a stenosis which obstructs blood flow in the artery. Magnetic Resonance Imaging (MRI), Computed Tomography (CT) scans or Doppler Ultrasound (US) scans, provided by the medical team, can give information about the geometry and the location of the plaque; however, do not explain the hemodynamic mechanisms with detail. Numerical simulations of blood flow can contribute as an auxiliary tool for the prevention and treatment of such diseases.

The spine is one of the most complex structures of the human skeleton and spine pathologies such as degenerative spinal diseases, trauma, spondylolisthesis, and deformity are common diseases. The knowledge of the lumbar spine kinematics is a very important tool for many clinical applications such as diagnosis, surgical interventions, and development of new spinal implants. Numerical simulations of spine biomechanics, based on CT images, present low costs and no risks to the biological tissue, and they are able to provide data, such as displacement and stress fields, which allow the prediction of surgery outcomes.

The present thematic session will provide a chance to biomedical and biomechanics engineers to discuss their knowledge, information and ideas about the latest numerical developments to simulate blood flow and spine biomechanics, with conditions as close as possible to the reality of each patient.

Topics of interest include (but are not restricted to):

- Patient-specific cardiovascular and cerebrovascular modelling
- Multiscale modelling of the cardiovascular system: Disease, development, progression and clinical intervention
- Biomechanics of soft tissues by MRI, CT and US
- Imaging and device biomechanics: Modelling, diagnosis, rehabilitation

- Cardiovascular, cerebrovascular and orthopaedic imaging: Advanced bioimaging
- Fluid-structure interactions in cardiovascular and cerebrovascular mechanics
- Rheological property of blood: Characteristics and modelling
- Atherosclerotic plaque: Mechanism and modelling
- Stenting within the cardiovascular and cerebrovascular system
- Validation and quantification in cardiovascular and cerebrovascular numerical modelling
- Human spine, characterization and modelling: Population based approaches
- Fracture mechanics of spine: in vivo, in vitro, modelling
- Traumatic loading of the spine and/or spine cord injury
- Multiscale biomechanics of articular degenerative diseases
- Biomimetric implants for spine repair / regeneration
- Computational joint mechanics
- Quantitative outcome assessments in orthopaedic trials
- Computational methodologies in diagnosis and surgery planning

Publications

The **proceedings book** will be **published by Springer** under the book series **"Lecture Notes in Computational Vision and Biomechanics"** and **indexed by Elsevier Scopus**.

A **special issue** of the **Taylor & Francis international journal "Computer Methods in Biomechanics and Biomedical Engineering: Imaging & Visualization"**, indexed in Clarivate Analytics Emerging Sources, Elsevier Scopus and dblp, **will be published**. All authors of works presented in VipIMAGE 2019 will be invited to submit an extended version to the special issue.

Important dates

• **Submission of extended abstracts**: **May 31, 2019** (final deadline)

• Final Papers (non-mandatory): July 15, 2019

Organizers

Sónia I.S. Pinto
LAETA-INEGI, Engineering Faculty of University of Porto
Rua Dr. Roberto Frias, 4200-465 Porto, Portugal
Email: spinto@fe.up.pt
URL: https://sigarra.up.pt/feup/pt/FUNC_GERAL.FORMVIEW?p_codigo=444844

Luísa C. Sousa

LAETA-INEGI, Engineering Faculty of University of Porto

Rua Dr. Roberto Frias, 4200-465 Porto, Portugal

Email: lcsousa@fe.up.pt

URL: https://sigarra.up.pt/feup/pt/func_geral.formview?p_codigo=208257

Catarina F. Castro

LAETA-INEGI, Engineering Faculty of University of Porto

Rua Dr. Roberto Frias, 4200-465 Porto, Portugal

Email: ccastro@fe.up.pt

URL: https://sigarra.up.pt/feup/pt/func_geral.FormView?P_CODIGO=211935