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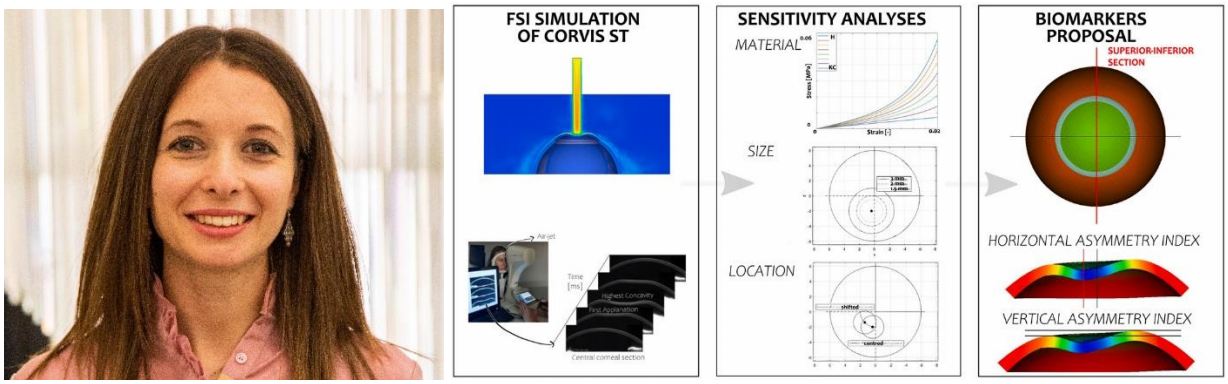
15.02., 14:30h, Sala de Conferencias Serrano 121

Speaker: ELENA REDAELLI, MSCA PH.D STUDENT (Opto-Biomechanical Eye Research Network)

Applied Mechanics and Bioengineering Group, Zaragoza University



EXPLORING CORNEAL BIOMECHANICS WITH COMPUTATIONAL SIMULATIONS

Abstract: Understanding the mechanical properties of the cornea is of great importance in studying corneal pathologies and predicting refractive surgery outcomes. Non-Contact Tonometry (NCT) is a non-invasive diagnostic tool intended to characterize the corneal tissue response in vivo by applying a defined air-pulse. The development of a strong numerical tool capable of modeling the NCT, applied to different structural and anatomical configurations, provides the basis for determining the biomechanical properties of the corneal tissue in vivo. A high-fidelity finite-element model of a patient-specific 3D eye for in-silico NCT will be presented; a fluid-structure interaction (FSI) simulation is developed to virtually apply a defined air-pulse to a patient-specific eye model. Then, a Montecarlo simulation is performed varying both the parameters describing the mechanical behaviour of the corneal tissue and the intraocular pressure. Based on the results of the Montecarlo simulation, a deep learning-based methodology is proposed to predict, in real time, the patient-specific corneal deformation and subsequently estimate the mechanical properties of the corneal tissue in vivo.

Elena Redaelli is a PhD student at Zaragoza University in the framework of the OBERON ITN Marie Skłodowska-Curie European Project. She holds a Master's degree in biomedical engineering from Politecnico di Milano. Elena worked as a Research Fellow at Wroclaw University of Science and Technology and at University of Bern. Her expertise lies in investigating the mechanical properties of soft tissues with a particular focus on corneal biomechanics using computational simulations and surrogate models. In 2021 she was awarded the Nellie Award in for her Master's thesis.

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