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Reconstruction of the Mechanical Properties in Optical Coherence Elastography

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Abstract: In this talk we present a mathematical model to reconstruct the mechanical properties of an elastic medium, in the optical coherence elastography imaging technique. We start by addressing the numerical simulation of the mechanical wave propagation and induced displacements. This direct problem is the computational basis to solve the inverse problem which consists of determining the parameters that characterize the mechanical properties of the medium, knowing the displacement field for a given excitation. We formulate the inverse model problem as a PDE-constrained optimization problem, where the objective function measures the discrepancy between observations and predictions. We will discuss different strategies for learning the space varying elasticity coefficients, which include the use of neural networks. We report several computational results that illustrate the behavior of the proposed methods in terms of accuracy and efficiency

Keywords: linear elasticity, inverse problem, mechanical properties reconstruction, optimization problem, neural networks.

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