DEEP LEARNING METHODS FOR A FLUID INVERSE PROBLEM

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Abstract. This work addresses the study of the inverse problem of obstacle recovery in the context of the Stokes system through a Deep Learning-based approach. A method was developed, which consists of a process in which binary images of obstacles are generated, and the corresponding solutions to the direct problem are computed. From these simulations, a dataset is constructed, enabling the inverse problem measurements for various obstacles in a region of interest on the outer boundary. Subsequently, various convolutional neural networks are employed in combination with hyperparameter estimation techniques based on Bayesian methods to obtain an accurate approximation of the inverse problem solution. This involves the reconstruction of the obstacle image from the measurements of the Cauchy tensor, achieving error levels that allow the recovery of geometries associated with a particular family of obstacles in the Stokes system.

Keywords: Geometrical Inverse Problems, Deep Learning, Stokes System, Numerical Reconstruction

Mathematics Subject Classifications (2010):

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