**Abstract for East Asia Section of Inverse Problems International Association (IPIA) - 7th Young Scholar Symposium (Dec 9-10, 2023)**

# A Bayesian Approach Combined with Machine Learning for Reconstructing Obstacles in Acoustic Waveguides

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In this talk, we investigate inverse obstacle scattering problems in acoustic waveguides. A Bayesian inference scheme, combining a multi-fidelity strategy and surrogate model with guided modes and a deep neural network is proposed to reconstruct the shapes of unknown scattering objects. The well-posedness of the posterior distribution is proved by using the f -divergence. Subsequently, a Markov Chain Monte Carlo algorithm is used to explore the posterior density. We propose a new multi-fidelity surrogate model to accelerate the sampling procedure while maintaining high accuracy.