Bayesian Approach to the Inverse Medium Scattering Problem

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In this talk, I would like to discuss the inverse scattering problem of determining an unknown refractive index from the far-field measurements using the nonparametric Bayesian approach. We use a collection of large "samples", which are noisy discrete measurements taking from the scattering amplitude. We will study the frequentist property of the posterior distribution as the sample size tends to infinity. We will use Gaussian like priors. The aim is to establish the consistency of the posterior distribution with an explicit contraction rate in terms of the sample size. The proof relies on the stability estimates of the forward and inverse problems. Due to the ill-posedness of the inverse scattering problem, the contraction rate is of a logarithmic type. If time allows, I also want to discuss the Bernstein- von Mises theorem when the refractive index is a piecewise constant function. This talk is based on joint works with Takashi Furuya and Pu-Zhao Kow.