Bayesian estimation of parameters in a stochastic problem of Diffuse Optical Tomography

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Abstract: Studying coefficient inverse problems in a stochastic setting has increasingly gained in prominence in the past couple of decades. In this talk, we will first present some results that were obtained for a Bayesian estimator built from the noisy data obtained in a simplified one-parameter Diffuse Optical Tomography (DOT) Model. We establish the rate of convergence of such an estimator in the supremum norm loss and show that it is optimal. This work extends the approach proposed by Abraham and Nickl in a recent article (On Statistical Calderon problems) and applies it to the problem in DOT setting. We also present some preliminary numerical simulations in support of our theoretical findings. Thereafter, we will talk about the simultaneous reconstruction of both absorption and diffusion coefficients in the DOT model. We present some very recent theoretical findings that establish the consistency of the well-posedness of the Bayesian inverse problem for piecewise constant parameters and show the consistency of the joint (posterior) distribution over the space of parameters . This is joint work with Dr. Taufiquar Khan (UNCC) and Dr. Thilo Strauss (Robert Bosch GmbH).