

Edge-promoting sequential Bayesian experimental design for X-ray imaging

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Abstract

This work considers sequential edge-promoting Bayesian optimal experimental design for X-ray imaging. The process of computing a total variation type reconstruction for the absorption inside the imaged body via lagged diffusivity iteration is interpreted in the Bayesian framework. Assuming a Gaussian additive noise model, this leads to an approximate Gaussian posterior with a covariance structure that contains information on the location of edges in the posterior mean. The next projection geometry is then chosen through A- or D-optimal Bayesian experimental design, which corresponds to minimizing the trace or the determinant of the updated posterior covariance that accounts for the new projection. The method is tested via numerical experiments based on simulated measurements.