Stability estimates for the expected utility in Bayesian optimal experimental design

Duc-Lam Duong (a), Tapio Helin (a), Jose Rodrigo Rojo-Garcia (a)

(a): Computational Engineering, LUT University, Lappeenranta, Finland

Abstract

We study stability properties of the expected utility function in Bayesian optimal experimental design. We provide a framework for this problem in a non-parametric setting and prove a convergence rate of the expected utility with respect to a likelihood perturbation. This rate is uniform over the design space and its sharpness in the general setting is demonstrated by proving a lower bound in a special case. To make the problem more concrete we proceed by considering non-linear Bayesian inverse problems with Gaussian likelihood and prove that the assumptions set out for the general case are satisfied and regain the stability of the expected utility with respect to perturbations to the observation map. Theoretical convergence rates are demonstrated numerically in three different examples.