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Mathematics Institute of Computational Science and Engineering - MATHICSE

SEMINAR OF NUMERICAL ANALYSIS

➤ **WEDNESDAY 6 FEBRUARY 2013 - ROOM MA A1 10 - 16h15**

Prof. Raul Tempone, (King Abdullah University of Science and Technology, Thuwal, Kingdom of Saudi Arabia) will present a seminar entitled:

"Fast estimation of expected information gains for Bayesian experimental designs based on Laplace approximations"

Abstract:

Shannon-type expected information gain can be used to evaluate the relevance of a proposed experiment subject to uncertainty. The estimation of such gain, however, relies in general on a double-loop integration which is usually computationally too expensive for realistic physical models, especially for those involving the solution of partial differential equations. We use the Laplace approximation for the integration of the posterior probability density function (pdf), to accelerate the estimation of the expected information gains in the model parameters and predictive quantities of interest. We obtain a closed form approximation of the inner integral and the corresponding dominant error term in the cases where parameters are determined by the experiment, such that only a single loop integration is needed to carry out the estimation of the expected information gain.

We demonstrate the accuracy, efficiency and robustness of the proposed method via several nonlinear numerical examples, including the designs of the scalar parameter in an one dimensional cubic polynomial function, the design of the same scalar in a modified function with two indistinguishable parameters, the resolution width and measurement time for a blurred single peak spectrum, and the boundary source locations for impedance tomography in a square domain.

Lausanne, 18 January 2013/FN/cr