1156-65-354 **Daniel I Gendin*** (digendin@bu.edu), 110 Cummington Mall, Boston, MA 02215, and **Paul E Barbone**. *Practical Computation of Uncertainty in Inverse Elasticity Problems.* Preliminary report.

We consider an inverse elasticity problem from a Bayesian probabilistic point of view, where we wish to approximate the posterior probability distribution of an elastic parameter field using data (likelihood) and regularization (prior). The Bayesian approach directly provides the posterior distribution of the sought elastic parameter field thus giving us the opportunity to estimate the field itself and to quantify its uncertainty. In practice, however, the discretized posterior distribution over random fields is very high dimensional (e.g. 10^4 dimensions). Furthermore, evaluating the posterior at any point requires solving a boundary value problem. Therefore, exploring the posterior is computationally challenging. We combine techniques from optimization theory and computational linear algebra to efficiently characterize the MAP point and the covariance within a Laplace (Gaussian) approximation of the posterior. In particular, while direct evaluation of the Hessian is computationally prohibitive, we show that a Newton method can be practically applied, following the methods presented in (Villa, et al. 2019). We further show that the Hessian and MAP point can be recovered at no additional computational cost, thus efficiently characterizing uncertainty in the MAP estimate. (Received January 27, 2020)