

## Shape optimization under constraints on the probability of a quadratic functional to exceed a given threshold

*Helmut Harbrecht*

Department of Mathematics and Computer Science, University of Basel, Basel, Switzerland  
`helmut.harbrecht@unibas.ch`

Coauthor(s): Marc Dambrine, Giulio Gargantini, Jérôme Maynadier

This talk is dedicated to shape optimization of elastic materials under random loadings where the particular focus is on the minimization of failure probabilities. Our approach relies on the fact that the area of integration is an ellipsoid in the high-dimensional parameter space when the shape functional of interest is quadratic. We derive the respective expressions for the shape functional and the related shape gradient. As showcase for the numerical implementation, we assume that the random loading is a Gaussian random field. By exploiting the specialties of this setting, we derive an efficient shape optimization algorithm. Numerical results in three spatial dimensions validate the feasibility of our approach.