

# Stochastic Galerkin Approximation of nearly Incompressible Elasticity

David Silvester<sup>1</sup>

We discuss the key role that bespoke linear algebra plays in modelling PDEs with random coefficients using stochastic Galerkin approximation methods. As a specific example, we consider nearly incompressible linear elasticity problems with an uncertain spatially varying Young's modulus. The uncertainty is modelled with a finite set of parameters with prescribed probability distribution. We introduce a novel three-field mixed variational formulation of the PDE model and focus on the efficient solution of the associated high-dimensional indefinite linear system of equations. Eigenvalue bounds for the preconditioned system are established and shown to be independent of the discretisation parameters and the Poisson ratio.

This is joint work with Alex Bespalov, Arbaz Khan and Catherine Powell

---

<sup>1</sup>The University of Manchester, Mathematics  
d.silvester@manchester.ac.uk