

# Semester/Masterthesis (RW/CSE) Masterthesis (INFK)

Supervisor: Prof. Ch. Schwab

## Implementation of parallel stochastic collocation FEM for stochastic PDEs

### Project description:

The numerical solution of PDEs with random coefficients is reduced to the solution of a deterministic parametric PDE on an infinite-dimensional parameter space. The parametric PDE problem is solved numerically by a sparse tensor collocation strategy in this parameter space. In theory, this approach can have vastly superior performance to Monte Carlo methods.

This project will show feasibility of this strategy in FEM solvers for elliptic PDEs with random coefficients on massively parallel hardware. Its goal is to establish computational superiority over Monte Carlo for practical problems.

To this end, an existing (wavelet) FEM code is ported to one of the parallel computing platforms at ETH, and a new, sparse tensor collocation strategy is implemented with emphasis on portability of the code.

Satisfactory completion of the project will lead to a journal publication. Direct continuation in a doctoral project in RW/CSE in 2011-2014 is possible.

**Prerequisites:** NumDGL RW/CSE (!)  
Intro Parallel Computing (!)  
NumSPDEs (FS09 or FS10)

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