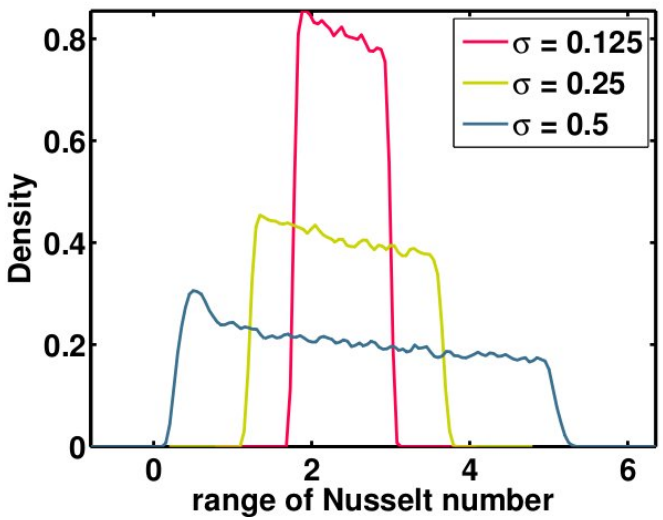
GRADUATE SCHOOL
computational engineering

TECHNISCHE UNIVERSITÄT DARMSTADT

Subject: Multilevel adaptive stochastic collocation methods in Uncertainty Quantification

Research Focus/ Cross-sectional Area: Uncertainty Quantification (R4)



Description:

Uncertainties exist in all branches of Computational Engineering. Most models describe the true physical system only approximately, data and model parameters are often not known accurately enough or vary between different instances due to e.g. fabrication process differences, smooth boundaries must be always considered as idealized in computer simulations. Uncertainty quantification (UQ) is a rapidly developing research area which tries to provide quantitative characterization of uncertainties and aims at reducing them in applications. UQ has been recognized as a crucial methodology necessary for continued advancement in computational engineering. In particular, multiphysics and multiscale simulations and optimization need to account for uncertainties in the models used. Recent developments include the use of generalized polynomial chaos expansions and collocation techniques on sparse grids for the representation of random variables and processes in order to investigate the forward propagation of uncertainty in systems governed by ordinary and partial differential equations.

We will develop new multilevel adaptive stochastic collocation methods for uncertainties in combustion, flow fields and materials.

Requirements:

Applicants are expected to have a strong interest in numerical analysis of dynamical systems with a close link to real life applications.

Supervisors: J. Lang, Numerics in PDEs
M. Schäfer, Numerical Methods in Fluid Dynamics
J. Janicka, Combustion