Masterarbeit - *Master thesis*
for
StudentName
Student No.: XXXXXXXX

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First examiner: Prof. Dr.-Ing. U. Nackenhorst	Supervisor: Esther Voelsen
Second examiner: XX	

Multifidelity importance sampling for non-linear stochastic finite element calculations

This thesis will address the efficient calculation of small failure probabilities for a structural engineering problem. In order to simulate a system failure realistically, the finite element program Abaqus is used to simulate damage evolution taking into account stochastic material inhomogentities. This results in high stochastic dimensions. Under these conditions, an ordinary Monte Carlo (MC) simulation for the determination of the failure probability results in unrealistically high computational costs.

Therefore, the goal is to reduce the computational costs by using the so-called Multifidelity Importance Sampling (MFIS). The idea of MFIS is to first create a computationally efficient substitute model with a lower accuracy (low-fidelity model). Based on this substitute model, the probability density function for the Importance Sampling is generated. It is also possible to use several substitute models in parallel.

For this thesis the first step is to choose a failure criterion for the provided FE-model. Afterwards at least one substitute model shall be generated and used for the MFIS. A suitable script has to be created for the MFIS.

Required knowledge (to be acquired by self-study if necessary): Finite element method, basic knowledge of Abaqus, programming knowledge (Matlab or Python). The thesis can be supervised and written in German or English.