Universität Konstanz

Fachbereich Mathematik und Statistik

Prof. Dr. S. Volkwein, JunProf. Dr. G. Ciaramella

Wir laden recht herzlich zu einem Vortrag im Rahmen des

## Oberseminars Numerische Optimierung

ein:

# Herr Stefan Hain

(Institut für Numerische Mathematik, Universität Ulm)

# *REDUCED BASIS METHOD FOR PARAMETER FUNCTIONS WITH APPLICATION IN QUANTUM MECHANICS*

## Dienstag, 11. Juni 2019

Beginn: **10:15 Uhr**
Raum: **C421**
Interessenten sind herzlich willkommen!

S. Volkwein, G. Ciaramella


**Abstract**: The aim of the project is to consider the time-dependent linear Schrödinger equation (SE)

$$\begin{aligned} \mathrm{i}\partial_t\psi(t,x) &= -\Delta\psi(t,x) + \mu(t,x)\psi(t,x) + f(t,x) && (t,x) \in (0,T)\times\Omega,\\ \psi(t,x) &= 0 && (t,x) \in (0,T)\times\partial\Omega,\\ \psi(0,x) &= \psi(x) && x \in \Omega, \end{aligned}$$

with a variable reaction coefficient $\mu$, which is interpreted as a parameter function within the Reduced Basis Method (RBM). Typically, the parameter space $\mathcal{P}$ is given by a finite-dimensional subset of $\mathbb{R}^P$, $P \in \mathbb{N}$. However, the parameter space consisting of all possible reaction coefficients is of infinite dimension. While finite-dimensional parameter spaces have been studied well, there has been done little work on the infinite-dimensional setting so far. First progress in this direction has been made by A. Mayerhofer and K. Urban, where the initial value of parabolic PDEs is interpreted as a parameter function. In the end, this setting should be transferred to a PDE constrained optimal control problem, where an external potential arises in the SE as parameter function.

For this we propose an ansatz based on a space-time variational formulation of the SE on which we want to focus in this talk. It is well-known, that a space-time variational formulation of a time-dependent paraterized PDE leads – at least analytically – to sharper error estimates for the reduced solution, which is a crucial aspect for the construction of a reduced model within the RBM. However, the setting of a well-posed variational space-time formulation with a weakly differentiable initial value as well as its stable discretization, based on tensor formats, is – according to our knowledge – not studied, yet. Numerical examples will be presented.


(eingeladen von JunProf. Dr. Gabriele Ciaramella)