INSTITUT FÜR ANGEWANDTE ANALYSIS UND NUMERISCHE SIMULATION

mathematik ians

Universität Stuttgart

Vortragsankündigung Institutsseminar

Sommersemester 2018

16:00 Uhr im Seminarraum 7.122

14.06.2018 **PD Dr. Christian Rieger** (Universität Bonn)

Kernel methods for parametric differential equations

Abstract:

Parametric differential equations are nowadays a well established methodology to model physical processes with unknown quantities. The unknown quantities are modeled as random fields which in turn lead (after an approximation) to high dimensional parameters in the differential equation. A common task is to compute either the full solution field depending on the parameters or some derived quantities of interest (QoIs). These QoIs are hence functions on a high dimensional space. The approximation of such functions is an interesting field. One aspect is that a suitable function space in which the QoI is contained depends on the regularity properties of the parametric differential equation. Another aspect is that the dimension of the domain of the QoI stems from an approximation and is hence a free parameter itself. A final aspect is that the function evaluations of the QoI require a numerical solution to a differential equation. Hence the function evaluations are corrupted by deterministic errors.

We will discuss recent progress on the deterministic a priori error analysis of such reconstruction problems. We will discuss the use of techniques from machine learning using problem dependent kernels. Furthermore, we will discuss several possibilities to choose sampling points for the evaluation of the QoI. Those choices include scattered points as well as sparse grids.

Finally, we will outline a few connections between kernel methods the emerging field of deep learning.

Alle Interessenten sind herzlich eingeladen!

Die Professoren des Instituts für Angewandte Analysis und Numerische Simulation

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having a coffee in a Banach space makes you feel complete

```
39 typedef Dune::ACFem::MassModel<EllipticModelType> MassModelType;
40 MassModelType bareMassModel(implicitEllipticModel);
41
42 auto massModel(mu * (mat.Z_a) * J + mat.Z_w) * bareMassModel);
```