Series kernels for high dimensional reconstruction problems

Christian Rieger
University of Bonn, Germany
rieger@ins.uni-bonn.de

In this talk, we will discuss series kernels and their applications in high dimensional problems. In many problems we are able to determine an application-adapted reproducing kernel which is however typically not available in closed form. This makes it necessary to approximate the kernel itself. In most cases, one can derive an infinite series expansion of the kernel. For numerical purposes, however, this infinite series has to be truncated. We will present some approximation properties of kernel methods based on such truncated kernels. Further, we present how such series expansion can be obtained from the application. As a model problem, we will focus on parametric partial differential equations as they appear in the field of uncertainty quantification. As the resulting kernels are in many cases smooth, we are able to show exponential convergence rates in the parameter discretization. Furthermore we use sampling inequalities to analyze non-intrusive methods. In particular, we derive error estimates which contain the error of solving the partial differential equation for a fixed parameter. This allows us to couple these two errors and to derive a final convergence rate.