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FAKULTÄT FÜR MATHEMATIK
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Einladung zur öffentlichen Defensio von

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Thema der Dissertation:

**Sampling and reconstruction in distinct subspaces
using oblique projections**

Abstract: This PhD project is about sampling and reconstruction of signals in distinct subspaces. The reconstruction method presented in the thesis uses the optimal weighting of the measurements and therefore projects as close as possible to the orthogonal projection onto the reconstruction space. Furthermore, we prove that this reconstruction method is the most stable with respect to a systematic error appearing before the sampling process. Adcock, Gataric and Hansen weighted the point samples of the Fourier transform in order to obtain a projection direction closer to the orthogonal projection onto the reconstruction space. This theory can be used for example to approximate compactly supported functions from nonuniform point samples of the Fourier transform.

Weighting the measurements has a major drawback that the stability with respect to measurement errors is reduced. The approximation calculated from unweighted measurements is in some sense most stable with respect to error present in the measurements and is called generalized sampling by Adcock and Hansen. We investigate how to vary continuously between the two extreme reconstruction methods.

In the last chapter, we consider the reconstruction of a non-bandlimited function represented by a finite number of compactly supported generating functions in wireless sensor networks. Using the theory presented in the first part, we develop a novel hierarchical reconstruction. The idea is to preprocess the sensor measurements locally by taking inner products with suitable vectors and to send the resulting data (rather than sensor measurements) to a global fusion center for further processing. In oversampled regimes, this approach reduces communication workload.

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