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Stable sampling in Hilbert spaces

In this talk we consider the problem of reconstructing an element of a Hilbert space in a particular basis, given its samples with respect to another basis. Such a problem lies at the heart of modern sampling theory. The last several decades have witnessed the development of a general framework for this problem, which, as we describe, admits a simple operator-theoretic interpretation in terms of finite sections of infinite matrices. Unfortunately, operators occurring in sampling problems are often non-self adjoint. Hence, the spectral properties of the infinite-dimensional operator are not typically inherited at the finite-dimensional level, leading to issues with both convergence and stability.

Recently, much progress has been made towards the approximation of spectra and pseudospectra of non-self adjoint linear operators. By using ideas developed therein, we present a new generalised sampling framework that overcomes these issues and possesses both guaranteed convergence and stability.

Joint work with Anders Hansen (Cambridge).