

Simon Hubmer: Frame Decompositions in Inverse Problems and Tomography.

In this talk, we consider the solution of linear inverse problems and their regularization via frame decompositions (FDs), which are generalizations of the singular-value decomposition (SVD). Similarly to the SVD, these FDs encode information on the structure and ill-posedness of a given problem, and can be used as the basis for the design and implementation of efficient numerical solution methods. We show that in contrast to the SVD, FDs can be derived explicitly for a wide class of operators. This in particular includes operators satisfying certain stability conditions such as the Radon or the Funk-Radon transform. We then consider various theoretical aspects of FDs such as recipes for their construction and solution properties of the reconstruction formulas induced by them. Furthermore, we discuss convergence and convergence rates results for continuous regularization methods based on FDs under both a-priori and a-posteriori parameter choice rules. Finally, we consider the practical utility of FDs for solving inverse problems by considering numerical examples from atmospheric and computerized tomography.