Contribution ID: **27** Type: **not specified**

Frame Decompositions and Inverse Problems

Thursday, 23 September 2021 10:50 (20 minutes)

The singular-value decomposition (SVD) is an important tool for the analysis and solution of linear ill-posed problems in Hilbert spaces. However, it is often difficult to derive the SVD of a given operator explicitly, which limits its practical usefulness. An alternative in these situations are frame decompositions (FDs), which are a generalization of the SVD based on suitably connected families of functions forming frames. Similar to the SVD, these FDs encode information on the structure and ill-posedness of the problem and can be used as the basis for the design and implementation of efficient numerical solution methods. Crucially though, FDs can be derived explicitly for a wide class of operators, in particular for those satisfying a certain stability condition. In this talk, we consider various theoretical aspects of FDs such as recipes for their construction and some properties of the reconstruction formulae induced by them. Furthermore, we present 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 two numerical examples from computerized and atmospheric tomography.

Primary author: Dr HUBMER, Simon (Johann Radon Institute Linz)

Co-authors: Prof. RAMLAU, Ronny (Johannes Kepler University Linz); Mr WEISSINGER, Lukas (Johannes Kepler University Linz)

Presenter: Dr HUBMER, Simon (Johann Radon Institute Linz)