International Journal of Mathematics and Mathematical Sciences

Special Issue on
Sparse Sampling and Sparse Recovery and Its Applications to Inverse Problems

Call for Papers

Many applications in science and engineering require the solution of an operator equation $Kx = y$. Often only noisy data are available, and if the problem is ill posed, regularization methods have to be applied for the stable approximation of a solution. Influenced by the huge impact of sparse signal representations and the practical feasibility of advanced sparse recovery algorithms, the combination of sparse signal recovery and inverse problems emerged in the last decade as a new growing area. Currently, there exist a great variety of sparse recovery algorithms for inverse problems. These algorithms are successful for many applications and have lead to breakthroughs in many fields (e.g., MRI, tomography). However, the feasibility is usually limited to problems for which the data are complete and where the problem is of moderate dimension. For really large-scale problems or problems with incomplete data, these algorithms are not well suited or fail completely.

In the context of signal recovery, generalized sampling theories were developed to tackle the problem of data incompleteness. One outstanding approach is the theory of compressed sensing. A major breakthrough was achieved when it was proven that it is possible to reconstruct a signal from very few measurements. A crucial condition for compressed sensing is the so-called restricted isometry property. Nowadays, this strong requirement has been relaxed in several ways, but so far all formulations of compressed sensing are in finite dimensions. Quite recently, first attempts of infinite dimensional formulations emerged. In this special issue, our focus is on stable and numerically feasible recovery algorithms and–and this is one major question–whether these technologies generalize to the solution of operator equations/inverse problems. Hence we invite authors to submit original research papers and review articles that provide the state of the art in this field and extend the known theory and contribute therefore to answer these questions. We are interested in articles that explore aspects of generalized sparse sampling, sparse recovery, and inverse problems. Potential topics include, but are not limited to:

- Generalized sampling principles and stable reconstruction
- Compressed sampling strategies and the solution of operator equations
- Compressive sampling principles and their extensions to infinite dimensions
- Sparse recovery principles for inverse problems
- Regularization theory for inverse problems with sparsity constraints
- Algorithms and their numerical realization

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