



Lothar-Collatz-Kolloquium für Angewandte Mathematik

Donnerstag, den 11. Mai 2017, um 17:15 Uhr, im Hörsaal 5

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Mathematical challenges in machine learning approaches for inverse problems

Zusammenfassung/Abstract:

The classical approach for mathematical applications in natural sciences and beyond is based on first building an analytical model (white model). This model is then analyzed and algorithms are constructed accordingly. This model based approach is only valid within the described mathematical framework, it is never complete. Hence, data driven 'black box' models are offering an alternative for either modeling the problem from scratch or for constructing suitable model updates.

We shortly review different strategies for data driven model updates (total least squares, low rank approximations) with a focus on approaches based on machine learning techniques. In particular we investigate how deep neural networks can be applied for solving inverse problems.

Our main aim is to better understand the mathematical properties of deep learning approaches, however, there is very little mathematical theory available presently.

Finally we present the mathematical model and its mathematical analysis for an application in medical imaging (MALDI imaging or Magnetic particle imaging) and show some results based on data driven model updates.

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<http://www.math.uni-hamburg.de/spag/angmath/kolloq/>