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Stability of Moment Problems and Super-Resolution Imaging

Initiative: zukunft.niedersachsen (nur ausgewählte Ausschreibungen)

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Laufzeit:

Data science in general and more specifically signal and image processing have sparked technological innovation and are changing our society on many levels. For example, modern imaging modalities like computerised tomography, fluorescence microscopy, and electron microscopy have become keystones for biomedical research. They allow for visualisation of structure and function at finest scales and thus are the basis of understanding the mechanisms of life as well as disease. However, these advances come with the urgent need for mathematical tools that describe the measurement process appropriately and give rise to effective reconstruction algorithms. Without doubt, already today's imaging relies on mathematical methods with the fast Fourier transform as the most prominent example. Even for small signals of only 0.25 megapixel, the fast Fourier transform is 50000 times faster than the conventional computation but this comes with the drawback of discretizing the spatial domain in advance and ignoring specific a-priori knowledge on the signal. On the other hand, pure mathematics offers algebraic geometry tools that allow for infinite resolution for very specific setups. The aim is to advance these methods towards realistic imaging scenarios and to make them robust against model mismatch and noise.

Projektbeteiligte

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