Bernoullis Tafelrunde

Graduate Student Seminar

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Wasserstein metric based full waveform inversion

Abstract

Full waveform inversion (FWI) is a widely spread signal analyzing technique. For example in seismology, it is used to determine the properties of the subsurface. The inverse problem is formulated as an optimisation problem of mismatch between observed and synthetic data. Common FWI uses the least-squares (L^2) norm to generate a misfit function. However, the function based on L^2 norm may have several local minima. Consequently, it requires initial values that are close to the global minimum in order to avoid convergence towards a local minimum, hence opening the possibility of ending up with wrong results.

In this thesis, it has been examined whether it is an advantage to work with the quadratic Wasserstein metric instead. The Wasserstein metric corresponds to the optimal cost of rearranging one density into the other and thus recognises well the phase shift of signals. Based on a model problem, the standard FWI (with L^2 norm) was compared to the FWI with quadratic Wasserstein metric. Numerical results demonstrate that the quadratic Wasserstein metric is a very promising choice of a misfit functional in seismic inversion.