PIMS / AMI Seminar

Friday, October 25, 2019
3:00 p.m.
CAB 657

"A computational algorithm for seismic waveform inversion problem based on Wasserstein distance objective function"

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Abstract

Recently, the optimal transport distance, or so-called Wasserstein distance has been introduced to full waveform inversion to compute the misfit between two seismograms. This measure has great potential to account for time and space shifts of events within the seismograms. However, there are two main challenges in the application of the Wasserstein distance to full waveform inversion. The first one is that the compared signals need to satisfy nonnegativity and mass conservation assumptions. The second one is that the computation of the Wasserstein distance between two seismograms is a large-scale optimization problem, which is computationally expensive. Here we propose a new method to address the two challenges. First, the Mainini strategy is employed to satisfy the two assumptions via decomposition and recombination of original seismic data. In addition, the computation of the Wasserstein distance based on the dynamic formulation is formulated as a convex optimization problem. Numerical results with reflection configuration have been used to demonstrate that the Wasserstein distance can enhance the interpretation of the deep reflections. Finally, we have applied the proposed method to SEG 2014 benchmark data, which has further demonstrated that our method can mitigate local minima and provide reliable velocity estimations without using low-frequency information in the recorded data.