

The smooth and not-so-smooth fitting of machine learning algorithms into a modern seismic inversion project

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Summary

Virtually every aspect of seismic exploration and monitoring technology is undergoing massive upheaval. Sensing technology, source technology, computational tools and architectures, and data analysis techniques all look and feel completely different than they did even a very short time ago --- to say nothing of the priorities and employment patterns of the users of this tech. Of all of the new technologies affecting the seismic method, machine learning (ML) seems to loom largest. I will sketch out the early stages of a seismic research program, focusing on monitoring of CO₂ injection and storage, in which every part of this technological landscape is leveraged. Broadband seismic data are acquired with standard and fiberoptic sensors as a baseline survey for time lapse monitoring, and the data are then used to drive waveform-based estimators of high resolution, multi-parameter rock physics models. Some of the inversion/estimation methods are ML-based, and some are not. I will describe some of our initial results and findings, and from these, cautiously draw conclusions about the scope and limits of ML in seismic inversion.