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and Transferability of a Convolutional Neural Network Deep Denoiser

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Seismic noise from a variety of nuisance sources frequently contaminates signals of interest. Effectively suppressing this noise is a crucial step in the processing pipeline. In a previous work, Tibi et al. (2021) developed a seismic signal denoising approach that uses a deep convolutional neural network (CNN) model to decompose an input waveform into a signal of interest and noise. While effective, this model, however, was limited in that it was trained on regional data from Utah, using recordings from vertical components only. In this study, we evaluate the transferability of the CNN denoising approach to global regions using data from the International Monitoring System (IMS) seismic station network. To train and test the denoiser, we curate high quality signal and noise datasets of seismograms recorded by stations of the IMS network and use them to construct >100 000 noisy waveforms. Furthermore, we extend the current methodology, which only utilizes the vertical component, to three components, resulting in a denoising model across all three components. In doing so, we demonstrate the validity of using machine learning derived datasets of noise in place of manually curated datasets which greatly reduces analyst time and effort.

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Promotional text

We present a new model for denoising 3-component seismic data trained using a deep convolution neural network.

Oral preference format

in-person

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