

# Data-driven ROMs, networks and imaging with waves

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## Abstract

Data-driven aka non-invasive ROMs are predominantly used when the full scale model is unknown and can be accessed only via measured data, hence the name. Recently a new outgrowth of this powerful approach has emerged in application to imaging with waves, e.g., seismic exploration, and radars. It is based on physical meaningful network realizations of the ROMs that can be interpreted as a finite-volume discretization of an underlying PDE. Thus the data can be embedded in the state-space of the PDE, the coefficients of which can be unknown. This, for example, allows us to estimate the state solution as well as the medium properties in the domain not accessible to measurements. I introduce the foundation of this approach on a 1D wave example in frequency domain, show its connection to some classical MOR techniques and time permitting, discuss multidimensional generalizations and applications to seismics and synthetic aperture radars.

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