Title	Transfer Learning to close the gap between experimental and numerical data
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Abstract	The deployment of Deep Learning (DL) strategies is particularly advantageous in Structural Health Monitoring (SHM) based of lamb Wave (LW) propagation due to the high quantity of data collected by the network of piezoelectric transducers (PZT) during all the life cycle of the composite structure. However, such strategies rely on large training databases, difficult to collect experimentally. The use of numerical simulations faces that issue, but the models never fit perfectly to the real structures, leading to error of diagnostic. We propose here to use Transfer Learning (TL) approaches to reduce the predictions errors of a Convolutional Neural Network (CNN) trained with numerical data. The network predicts the size and the position of a damage on a composite plate equipped with PZT. It is trained on a large source database composed of different damage scenarios on a composite plate. A second smaller target database is generated with small variations on the mechanic properties and PZT positions to simulate manufacturing uncertainties. Those uncertainties lead to prediction errors of the CNN. A Domain Adaptation (DA) based on Optimal Transport (OT) is used to project the target data on the source domain and therefore reduces the predictions error of the CNN. These TL approach should allow us to close the gap between experimental and numerical data.

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