

# **Application of machine learning algorithms to TFM imaging to improve the characterization of crack-like defects**

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It is now widely agreed that machine learning (ML) algorithms have a tremendous potential in NDT and in particular in the purpose of automated classification and/or characterization of defects. In this communication, we demonstrate and evaluate this potential in phased-array ultrasonics with a specific case of interest corresponding to the multi-mode TFM imaging of crack-like defects. In multi-mode imaging, an accurate characterization of the defect may require extracting information from several images provided by the FMC acquisition, each image being associated with a reconstruction mode involving reflections and mode conversions at the interfaces of the testing sample. The selection of relevant sets of images, corresponding to relevant reconstruction modes, is not a trivial task. In this work, performed in the context of the European project ADVISE, we have applied standard ML algorithms, with particular emphasis on shallow and deep learning methods, to multi-mode TFM images. The capabilities of the CIVA software to provide representative simulated data via database generation tools have been used in order to train the ML algorithms. The performances of the tested algorithms have been assessed on both numerical and experimental data. In the communication, we present the approach we have adopted and the results which have been obtained.