

# Metamodels and Statistical Tools Applied to Non-destructive Testing Problems

**Roberto MIORELLI<sup>1</sup>**, Christophe REBOUD, Pierre CALMON

*CEA-LIST, Department of Imaging and Simulation for NDT*

In the last decades, the non-destructive testing (NDT) research community has greatly increased its interest on statistical methods. This interest was driven by the community willingness to provide efficient solutions to NDT problems and push further the use of simulation to better design NDT inspection systems and procedures.

This research brought to the developments of new solutions to carry out sensitivity analysis, compute model assisted probability of detection, perform flaw(s) detection, flaw(s) characterization and probe optimization. Toward this end, the use of metamodels (also known as surrogate models) have been widely exploited for different NDT physics (ultrasound testing, eddy current testing, infrared thermography, etc.) with promising results. More recently, the NDT community is focussing on providing advanced simulation tools for performance estimation under uncertainties. One of the main area of interest of this research turns concerns the estimation of uncertainties for flaw(s) detection, characterization, and optimization problems. These developments have been particularly boosted and supported by the recent achievements in the field of machine learning that provide a plethora of algorithms and tools suitable for solving many different NDT problems.

This talk provides an overview on the use of metamodel tools and statistical methods applied to NDT problems developed at CEA LIST. A set of test cases that are matter of interest in the industrial domain are detailed and discussed. Moreover, some insights on the choices done to satisfy the different constraints imposed by the industrial domain are provided too.

## *References:*

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