



DC6

PhD Enrolment: University of Thessaly

Duration: 36 Months

Specific Deliverable: SD3.2, SD4.3

Time Input: [WP4 50% WP5 50%]

Secondments:

IBM, Mattia Rigotti, (M13-M18) 6 months on automated inspection technology and information theory.

Arteria Srl, Antonio Addari, (M31-M33), 3 months on art transport monitoring needs.

Optimal sensor placement & measurement for monitoring with edge-network

Context

DC6 will develop optimal sensor placement (OSP) and measurement strategy (type, location, density, number of sensors) for asset and technology agnostic SHM applications using minimal measurements at selected times during the monitoring period while maximizing information. It will minimize power at sensor edge, remaining resilient against various sources of uncertainties arising from operational/environmental conditions, manufacturing variabilities and model errors expected from physics-based computational/AI/data science models for condition diagnosis/predictions.

Objectives (Ob):

Ob1: Develop an OSP framework using information theory (i.e., mutual information, relative entropy, Kullack-Liebler divergence) maximizing sensor information and minimizing cost/resources of instrumentation /operation.

Ob2: Develop appropriate indices using utility theory, for type, location and number of sensors in an asset/population of assets, quantified via Bayesian learning tools for

uncertainty management accounting for reliable damage diagnosis and virtual sensing of features of interest.

Ob3: Minimize cost and instrumentation & measurement efforts by identifying and avoiding redundant information multi-sensor networks, considering costs of sensors and installation in difficult areas (e.g. underwater, offshore, rotating parts), investigating to what extent a higher number of cheaper sensors can offset information from a lower number of high-fidelity sensors.

Ob4: Extensive open benchmarks for DIAMOND application sectors for a range of sensors and related monitoring algorithms at edge.

Expected Results (R):

Overall: A framework and open benchmark for maximized information from minimal monitoring at the edge with transferability to different sectors.

R1: Open numerical framework, indices and software tools for maximum information with minimal sensing at the edge.

Open repositories of

R2: performance of developed tools for different sensors and network topologies

R3: scenario of asset (component, individual, fleet) typologies linked to sensor network performance.

R4: Implementation of developed framework in DIAMOND application sectors (e.g. art transport, turbines, machinery) for best practice guidance and adapting to new application sectors.

Contributions for Recruited Researchers over 36 months

Living Allowance: €125304.48

Mobility Allowance: €25560

Family Allowance: (where relevant) €17820

This position and related financial contributions is subject to the commencement of the project and agreement signed.