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Machine learning for parameters identification in structural joints models

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In the context of multi-material lightweight assemblies, structural joints such as adhesives and bolts should be taken into account in the FE models for a reliable representation of the reality. The goal of this research work is to identify the parameters of the joints models exploiting the potential of the Virtual Sensing techniques.
Parameters identification can be achieved via the minimization of the error between model results and experimental results. In the current research work, a parametric-reduced model and a set of measurements are combined in a stochastic estimator such as an Extended Kalman filter, that tracks the dynamic states and parameters of the assembly under investigation.
In the next steps, Machine Learning approaches will be investigated in view of a benchmarking with the current methods, but also in view of an integration between them. Machine Learning will be used to define new surrogate models, able to mimic the relation between the physics-inspired model parameters (to be later identified) and product performance. According to this scheme, the physics-inspired models will be used to produce a set of training data for the Machine Learning algorithm, and the resulting surrogate model will be used in the above-mentioned parameter identification schemes.

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