Dynamic performance of architected beam structures

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Abstract

The contribution investigates the dynamic vibration performance of architected beam structures, engineered with different triply periodic minimal surface topologies, both experimentally and numerically. Their eigenfrequency response as a function of the inner topological designs is analyzed, providing insights into the effect of topology and relative density on the recorded mechanical performance (Figure 1). Topology-dependent modifications of the dynamic response are identified that are not feasible for solid and non-architected structures. Moreover, their dynamic damping performance is assessed, quantifying topological effects along with the role of inner material grading. Furthermore, machine learning models are developed, capable of predicting the dynamic performance and employed, not only as universal predictors, but also as surrogates for the inverse estimation of the feature importance of the underlying design parameters. Overall, the work provides benchmark results and insights into the dynamic performance of architected beam structures.

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