

## ANDIS XX – 2025

The problem of structural identification has received great attention in the scientific literature. If the system to be identified presents nonlinear characteristics, then the challenge becomes particularly captivating and interesting. This is the case, for example, of the evaluation of the constitutive parameters of a prestressed beam, where any prestressing losses induce a nonlinear moment-curvature law. This work draws inspiration from [1], where the identification of the parameters of a 2 d.o.f. nonlinear mechanical system is performed through the combined use of the Hilbert Huang Transform (HHT) with the analytical technique of Complexification Averaging (CxA), starting from the processing of time-histories acquired experimentally or simulated numerically. The same technique was then implemented in [2] and extended with stochastic analyses, where the attention was shifted to a prestressed beam with prestressing losses. Here we want to verify the possibility of proceeding to the identification of the nonlinear constitutive parameters of a prestressed beam, combining the HHT with the Multiple Scale Method (MSM), in order to take advantage of the possibility of operating directly on the partial differential equations of the continuous system, thus avoiding modal projections. The final objective is to identify the constitutive parameters that simulate the piecewise linear behavior of the moment-curvature law of the beam.

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[1] Kerschen, G., Vakakis, A.F., Lee, Y.S., Mc Farland, D.M., Bergman, L.A., “Toward a Fundamental Understanding of the Hilbert-Huang Transform in Nonlinear Structural Dynamics”, *Journal of Vibration and Control*, 14(1-2), page 77-105 (2008).

[2] Scozzese, F., Dall’Asta, A., “Nonlinear Response Characterization of Post-Tensioned R.C. Bridges through Hilbert–Huang Transform Analysis”, *Structural Control and Health Monitoring*, 24, Article ID 5960162, (2024).