

Ensemble classification method for structural damage assessment under varying temperature

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© 2017, The Author(s). Vibration-based damage assessment approaches use modal parameters, such as frequency response functions, mode shapes, and natural frequencies, as indicators of structural damage. Nevertheless, these parameters are sensitive not only to damage but also to temperature variations. Most civil engineering structures are exposed to varying environmental conditions, thus hindering vibration-based damage assessment. Therefore, in this article, a new damage assessment algorithm based on pattern recognition is proposed to scrutinize the healthy state of a structure in the presence of uncertainties such as noise and temperature. The algorithm adopts a combination of couple sparse coding and deep neural network as an ensemble system to assess damage. The proposed method is validated using a numerical model of a truss bridge and experimental data of the I-40 bridge. The results demonstrate its efficiency in the localization and quantification of damages under varying temperat