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Unsupervised artificial neural network approach for abnormality recognition in large-scale offshore floating structures

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ABSTRACT

This study proposes a robust data-driven method for structural health monitoring of large-scale floating structures in ocean environments. The method utilizes autoencoder, a widely adopted unsupervised artificial neural network algorithm, to detect abnormalities within the system. Validation of the proposed method is conducted using hydrodynamics-based simulations. Initially, structural response data for both intact and damaged scenarios of the target structure is generated through simulation. Subsequently, the structural behavioral pattern under intact conditions is extracted through training of the ANN model. Finally, abnormality recognition is achieved through encoding and decoding procedures employing the trained model and structural responses. The feasibility and applicability of this approach are demonstrated through validation across various mooring line failure cases.

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