Damage Classification Utilizing Autoencoders and Convolutional Neural Networks

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Key Words: SHM, Autoencoder, Convolutional Neural Network, Image Processing

ABSTRACT

Structural Health Monitoring (SHM) is an increasingly important field in civil engineering, as it plays a crucial role in detecting changes in the condition of structures and identifying potential damage. To achieve this, SHM strategies often employ Artificial Intelligence (AI) techniques, which involve analyzing raw dynamic data obtained from structures to perform classifications or extract relevant features. Among the various AI algorithms used in SHM, autoencoders and convolutional neural networks (CNNs) have emerged as promising solutions, and this article focuses on discussing their application.

In this study, the researchers applied both autoencoders and CNNs to identify eight different damage scenarios in a beam. They utilized the time histories of the tested structure obtained through monitoring with a high-speed camera using image processing techniques.

By comparing the results obtained from both algorithms, the researchers were able to highlight their respective strengths and weaknesses in the context of SHM. This information can assist engineers and researchers in selecting the most appropriate algorithm based on the specific requirements of their monitoring project.