ABSTRACT:

Artificial Neural Network (ANN) has been widely applied to detect damages in structures based on structural vibration modal parameters. However, uncertainties that inevitably exist in finite element model and measured vibration data might lead to false or unreliable prediction of structural damage. In this study, a statistical approach is proposed to include the effect of uncertainties in the ANN algorithm for damage prediction. ANN is used to predict the stiffness parameters of structures from measured structural vibration frequencies and mode shapes. Uncertainties in the measured data and finite element model of the structure are considered in the prediction. The statistics of the identified parameters are determined using Rossenblueth's point estimation method and verified by Monte Carlo simulation. The results show that by considering these uncertainties in the ANN model, the damages can be detected with a higher confidence level.