

OUTPUT-ONLY MODAL IDENTIFICATION USING UNSUPERVISED MACHINE LEARNING APPROACH: A CASE STUDY OF FREE VIBRATION

S. NILNOREE¹, A. TAPARUGSSANAGORN, and CK. GADAGAMMA³

¹ *Doctoral Student, Asian Institute of Technology, Pathumthani, Thailand,*

² *Associate Professor, Asian Institute of Technology, Pathumthani, Thailand,*

³ *Assistant Professor, Asian Institute of Technology, Pathumthani, Thailand,*

Correspond to S. NILNOREE (st122188@ait.asia)

Keywords: *Modal Analysis, Modal Identification, Output-only Modal Identification, Blind Source Separation, Machine Learning*

ABSTRACT

Machine learning models have great impact on many fields of applications nowadays. This study discusses a study of unsupervised learning approaches, namely Independent Component Analysis (ICA) and Principal Component Analysis (PCA) to identify modal parameters, i.e., natural frequencies, mode shapes, and damping ratios. They are also known as non-parametric algorithms. The concept behind is that the modal responses can be considered as the source signals and they are independent of each other. The numerical simulations on the 3-DoF structure are carried out under free vibrations to illustrate the performances and limitations of the proposed approaches. The estimated modal responses are investigated in both time domain and frequency domain. In addition, Modal Assurance Criterion (MAC) is used to indicate the consistent between mode shapes.