Wavelet-like CNN Structure for Time-Series Data Classification

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ABSTRACT

Vibration is one of the richest information in manufacturing field. Due to its cheap acquisition, vibration has become “big data” in manufacturing fields. Recently, deep learning models shows state-of-art performance on analyzing big data due to its sophisticated structure. Traditional models for a machinery monitoring system has been highly dependent on features selected by humans. Besides, its representational power fails as data gets complicatedly distributed. On the other hand, deep learning models automatically select highly abstracted features while optimization process and its representational power overcomes traditional models. However, its applicability in PHM field has been investigated mainly based on image data. This paper introduces a CNN model for a ‘vibration data’ which is the richest data in manufacturing field. We integrate ‘residual fitting’ mechanism into the CNN structure. As a result, the architecture combines signal re-construction and classification procedures into a single model. Validation results based on the rotor vibration data suggest our model outperforms any other off-the-shelf feature-based models and the deep learning models recently proposed in PHM field.