# NEURAL NETWORK-BASED SYMBOLIC REGRESSION FOR EMPIRICAL MODELING OF THE BEHAVIOR OF A PLANETARY GEARBOX

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**Résumé**

Gearbox condition monitoring and quality surveillance are crucial techniques to ensure safe and cost-efficient machine operations. In condition monitoring, the interpretation of the different vibration spectrum elements is still an open question, many works show that some predefined vibration models are improper to explain the spectrum contents. In this paper, we investigate a method to identify the mixture model that describes a single-stage planetary gearbox vibration to properly interpret the vibration spectrum. Our method is based on neural network-based symbolic regression, a so-called equation learner that describes the vibration model based on prior knowledge about the planetary gearbox rotation frequencies. The method employs an end-to-end differentiable feed-forward network trained with sparsity regularization that promotes an interpretable and concise expression for the vibration measurement. With this, the obtained model contributes to increasing the effectiveness of vibration-based condition monitoring in the planetary gearbox with proper separation of the elementary vibration sources. Our proposed approach yields promising results in modeling and sources estimation based on simulated data, even at low SNRs

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