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A comparative study of three artificial neural networks for the detection and classification of gear faults. (English) [Zbl 1078.68681](#)

Int. J. Gen. Syst. 34, No. 3, 261-277 (2005).

Summary: Artificial neural networks (ANN) have been recognized as a powerful tool for classification and pattern recognition in various fields of applications. This paper presents an overview of three ANN architectures and the results of applying those ANNs for the detection and classification of malfunction, wear and damage of a gearbox operating under steady state conditions. The ANN models studied are: feed forward back propagation (FFBP), functional link network (FLN) and learning vector quantization (LVQ). Three artificial defects were deliberately introduced to the gearbox and these are: (1) loose key, (2) single tooth flank wear and (3) full tooth breakage (missing tooth). Vibration signals, collected from extensive experimentation, were analyzed using time and frequency domain descriptors that were used as feature vectors to feed the ANNs. The results show that, for this study, the FLN learns more quickly and is more accurate in operation than the FFBP or the LVQ. The LVQ algorithm exhibits faster rate of convergence than the FFBP but suffers more from misclassifications.

MSC:

[68T05](#) Learning and adaptive systems in artificial intelligence

[68T10](#) Pattern recognition, speech recognition

Keywords:

[clustering](#); [diagnosis](#); [functional link network](#); [learning vector quantization](#); [neural network](#); [pattern recognition](#)

Full Text: [DOI](#)

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