

Tutorial 1: Development of a Sound Analysis Tool for Pre-Diagnosis of Mechanical Failure

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Abstract:

Early detection of mechanical failures is crucial to avoid unexpected downtime and reduce maintenance costs. However, in many field situations, technicians may not have access to specialized diagnostic tools such as vibration sensors or acoustic emission equipment. In such cases, a **pre-diagnosis using sound analysis** can offer a practical and effective alternative, enabling initial assessments with minimal resources.

This paper presents a novel technique based on **Sound Analysis (SA)**, which complements vibration analysis by focusing on audible sound waves within the 20 Hz to 20 kHz frequency range. Bearings emit characteristic sounds in addition to mechanical vibrations, which can be captured using smartphones and analyzed through a Python-based algorithm.

The proposed method aims to provide a cost-effective and accessible tool for the **pre-diagnosis of mechanical failures**. Two case studies are presented: one involving a bearing in an electric motor and another in a wind turbine. The results are compared with traditional diagnostic techniques to validate the effectiveness of the sound analysis approach.