



Feature Extraction from Railroad Bearing Onboard Vibration Sensors Using Machine Learning Models

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Date & Location



1:00 PM CDT
August 22, 2025



Engineering Building
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Microsoft Teams
Meeting ID: 2810050066571
Passcode: Da9bX6An

Abstract

The railway industry faces approximately 1,000 train derailments annually, highlighting the insufficiency of traditional condition monitoring and maintenance methods. To address this, advanced artificial intelligence (AI) and machine learning (ML) algorithms were developed and implemented, leveraging vibrational data collected by the University Transportation Center for Railway Safety (UTCRS). Using signal de-noising and analysis techniques, key features, such as speed, were extracted from vibration signatures gathered by the onboard accelerometers. The extraction was computed by utilizing a combination of filters and transforms to deconstruct the vibrational signal in the frequency domain and use a pairwise peak analysis with K-means ML algorithm to cluster speeds and output defect frequencies, speeds, and confidence scores. This project contributes to UTCRS three-stage bearing health assessment, allowing for an accurate, instantaneous prediction of speed for accurate defect detection without the need for GPS-based speed calculations.