

INFORMS RAILWAY APPLICATIONS SECTION

# Data Processing and Model Benchmarking for Predictive Maintenance in Railways: A Modular Pipeline Approach



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**10:00 EST NEW YORK**

**16:00 CET AMSTERDAM**

**22:00 CST BEIJING**



Registration link:

<http://tiny.cc/raswebinar-32>

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**Questions ?**

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**Title: Processing and Model Benchmarking for Predictive Maintenance in Railways: A Modular Pipeline Approach**

**Abstract:** Predictive maintenance is increasingly important in railway operations, enabling timely interventions that reduce costs, improve safety, and prevent unplanned failures. Condition monitoring data are often heterogeneous and low quality, with sparsity, noise, misalignment, and missing values, which complicates model selection. We present a modular preprocessing pipeline for railway sensor streams, integrating multi scale denoising, trend extraction, and temporally consistent fusion across WPD, WILD, THD, mileage, and operational records. The resulting monthly wheel dataset improves fidelity, achieving up to +16.7 dB SNR. Benchmarking shows preprocessing is decisive; LightGBM performs best internally, while XGBoost generalizes best externally.

**Bio:** Kristopher Aliferis is a fourth-year undergraduate student pursuing a Bachelor of Engineering Science in Software Engineering at the University of Western Ontario, and he plans to begin an MSc in Computer Science this coming fall. From May to August 2025, he conducted research with the MoTech Group, supported by an NSERC Undergraduate Student Research Award, working with Farzan Heidari and Tangjian Wei on predictive maintenance for railway systems. His work focused on preprocessing heterogeneous condition-monitoring data and benchmarking machine learning models under forward-in-time evaluation for the INFORMS Railway Applications Section Problem Solving Competition, contributing to the team's first-place solution.