

Internship/Thesis - Fleet-Level Robust Modeling for Embedded Accelerometer Self-Diagnostics in Railway Systems

Description

This thesis addresses fleet-level consolidation of embedded machine learning models for accelerometer self-diagnostics in railway systems deployed on the COSAMIRA Edge platform. Each device currently learns the expected accelerometer behavior using speed and acceleration data and detects sensor faults through deviation from the learned model.

Such a system is used in large railway fleets where multiple trains of the same type operate under varying mechanical, environmental, and seasonal conditions. While per-device learning works, it does not generalize well across the fleet and may be sensitive to train-specific dynamics or temperature effects.

The objective of this thesis/internship is to design a method to collect learned models from selected devices, normalize and aggregate them into a single robust fleet-level model that remains stable despite inter-train disparities and seasonal variations.

Main challenges include:

- Robust model aggregation under heterogeneous operating conditions
- Outlier detection and rejection
- Ensuring insensitivity to mechanical and environmental variability
- Defining objective criteria to validate that local learning converged successfully
- Extending both the learning and inference phases to improve robustness and early fault detection
- The outcome will be a scalable fleet-intelligent framework for reliable embedded sensor health monitoring.

About Televic Rail

With over 30 years of experience in designing, manufacturing and maintaining on-board communication and control systems, Televic Rail is a leading, trusted partner for railway operators and train builders worldwide.

Its Passenger Information Systems and Control Systems are high quality, tailor-made solutions that offer the flexibility, user-friendliness and stability that our clients ask for. Our various types of on-board control systems such as our bogie monitoring systems are innovative, yet reliable products designed specifically for the railway business.

Trains and trams all around the world are equipped with Televic Rail solutions, from New Zealand to Canada, from China to the United States, from India to Belgium, England and France.

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Nature of the work

Level	Keywords	Type of work	Location	Num. of students
Academic Master, Master	AI / Machine Learning, Embedded Software, Software	Research: 20% Implementation: 30% Experimentation: 50%	Televic	1