

Precision Reliability Monitoring of Low-Speed Rotating Assets

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Research Overview

Low-speed conveyor bearing defects are a critical operational vulnerability, often causing up to 30% of costly unscheduled downtime. Our project introduces a robust, multi-modal sensing pipeline designed for precision reliability monitoring, overcoming industrial noise by fusing continuous vibration, acoustic, and thermal data. This advanced system ensures proactive quality assurance for vital assets, targeting a major reduction in unscheduled downtime and setting a new standard for operational continuity.

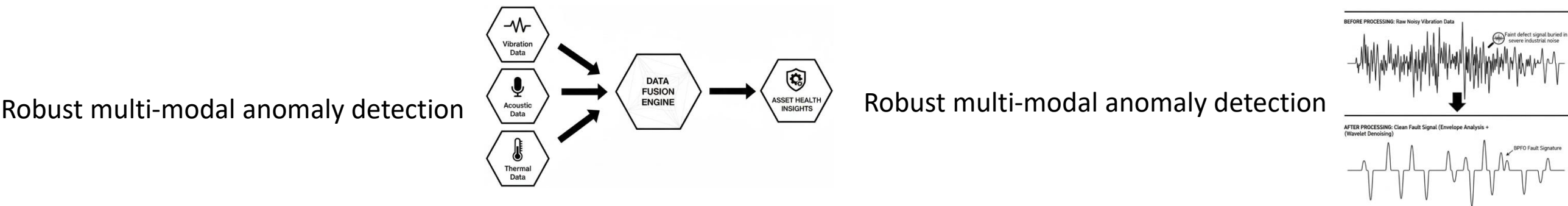
Industry Relevance

- Potential applications:** Bulk material handling; Logistics and distribution; automotive and manufacturing; Wider rotating assets.
- Benefits:** Targets a major reduction in unscheduled downtime, directly avoiding emergency repair costs and significant per-hour production losses.
- Alignment with sector priorities:** Proactive quality assurance; Resilience and continuity

Methods & Technologies

The project uses a novel intelligent pipeline to achieve real-time defect detection. To overcome industrial noise, we employ Envelope Analysis and Wavelet Transform for subtle noise detection, strategically fusing multi-modal data (vibration, acoustic, and thermal). We deploy lightweight AI models, optimized for edge computing, to ensure fast and scalable processing. Validation is conducted at the unique UWE Festo CP Lab, where we accurately simulate realistic, hard-to-detect bearing fault signals.

Innovations



Opportunities

- We seek access to operational low-speed conveyor systems for sensor array installation and final data collection.
- Collaboration opportunities to integrate our lightweight detection models directly into existing plant monitoring systems (e.g., PLC/SCADA or CMMS).
- Opportunities to gain deep operational knowledge and for industry experts to guide the final output into practical industry guidelines.

