PRESS RELEASE

New Edge AI solutions for intelligent sensors to help predict and maintain industrial systems

Fraunhofer IPMS develops an intelligent demonstrator for the predictive maintenance of industrial plants

The Fraunhofer Institute for Photonic Microsystems IPMS presents a groundbreaking demonstrator for predictive maintenance of industrial equipment. The demonstrator uses advanced sensor technology combined with artificial intelligence (AI)-based data processing to detect potential machine damage at an early stage and avoid costly downtime.

Based on the results of the iCampus project ForTune, Fraunhofer IPMS has developed a new demonstrator that combines sensor technology, data acquisition and AI-based data evaluation for condition monitoring and predictive maintenance. This opens up new possibilities for the preventive maintenance of plants and machines. Fraunhofer IPMS uses its expertise in edge computing and real-time data transmission. Dr. Marcel Jongmanns, project leader at Fraunhofer IPMS, explains: "Our solution enables precise condition monitoring of machines through the use of sensors and intelligent data analysis. By integrating AI into the sensors, we can detect damage before it occurs, optimize maintenance intervals and minimize downtime.

The showcase displays a miniaturized conveyor belt and demonstrates the performance of a novel toolbox for industrial plant monitoring. The demonstrator uses multimodal sensors. The sensor function records accelerations in the spatial directions and the corresponding rotation rates. In addition, magnetic field sensors and acoustic or ultrasonic sensors are used to monitor the industrial equipment. The system provides two main functions: Belt tension detection and jam detection. The AI models are based on extensive data analysis and enable accurate prediction of damage. To increase the accuracy of the models, real-time calibrations can be performed to adapt the system to new environments.

The Fraunhofer IPMS system solution aims to combine the in-house sensors with its own edge computing unit based on RISCV architecture for efficient data processing directly at the point of use. This enables complex AI operations and real-time analysis. Changing environmental influences can be directly modeled or taken into account in the analysis. This enables the integration of a large number of sensors and significantly increases the accuracy of predictions about the condition of the industrial equipment. Existing limitations in computing power for real-time modeling in embedded systems are overcome.

The expertise of Fraunhofer IPMS in the field of sensor technology and AI evaluation enables the continuous further development of the technology. Existing partnerships with companies such as Vetter Kleinförderbänder GmbH demonstrate the industry's interest in such solutions.

During the SENSOR+TEST trade fair from June 11 to 13, 2024 in Nuremberg, visitors will have the opportunity to view the demonstrator at the Fraunhofer IPMS booth 1-317. The scientists will be on site to answer questions and provide insights into the research work. Appointments for personal discussions can be arranged in advance on the Fraunhofer IPMS website:
https://www.ipms.fraunhofer.de/en/events/2024/Sensor_Test.html

----
About Fraunhofer IPMS
Fraunhofer IPMS is one of the leading international research and development service providers for electronic and photonic microsystems in the application fields of intelligent industrial solutions and manufacturing, medical technology and health, and mobility. In two state-of-the-art clean rooms and with a total of four development sites in Dresden, Cottbus and Erfurt, the institute develops innovative MEMS components and microelectronic devices on 200 mm and 300 mm wafers. Services range from consulting and process development to pilot production.

Images

Predictive Maintenance Demonstrator for Industrial Equipment
© Fraunhofer IPMS

Predictive Maintenance at industrial plants
© freepik

The **Fraunhofer-Gesellschaft**, based in Germany, is the world's leading applied research organization. By prioritizing key technologies for the future and commercializing its findings in business and industry, it plays a major role in the innovation process. A trailblazer and trendsetter in innovative developments and research excellence, it is helping shape our society and our future. Founded in 1949, the Fraunhofer-Gesellschaft currently operates 76 institutes and research units throughout Germany. Around 30,800 employees, predominantly scientists and engineers, work with an annual research budget of roughly €3.0 billion, €2.6 billion of which is designated as contract research.