AI algorithms to monitor the performance and condition of vibrating machines

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EXTENDED ABSTRACT

Vibrating machines such as screens and feeders are used for classification and conveying of bulk material in various industries such as mining, steel and cement. In correlation with the high-value throughput of the target processes, there are numerous valuable **information** to support the efficient operation of these assets.

The valuable information includes **performance parameters** (total load, distribution of bulk material, speed, stroke, etc.) as well as **condition parameters** to enable a cost-saving preventive maintenance strategy. Yet, as per known industry standards, this type of information is latent in most cases leading to significant unused cost-saving opportunities.

As empirically known today, most performances as well as condition parameters do actually correlate with the machine's motion pattern. State-of-the-art accelerometers can be used to capture the motion of a vibrating machine.

The challenge is to **extract the valuable information from the cryptic and complex motion raw data,** which is being addressed by diverse AI (Artificial Intelligence) pacemaker technologies. Understanding AI as the automation of intelligent behavior, the task of each AI algorithm is to process accelerometer raw data and output very specific information, which otherwise would need to be given by a human expert. The approaches to create such AI algorithms encompass diverse Data Mining technologies solving classification problems (diagnosis) and time series extrapolation problems (prognosis). However, it is experienced that an empiric learning approach is to be combined with human domain expertise in order to reach a decent level of reliability and accuracy.

Development and **advancement of AI is considered an ongoing process**. As more data is collected over time, the database is growing, and so does the potential of AI – referring to capability and reliability. The challenge is to create a suitable ***Data Processing Framework***, which supports the continuous process in a scalable manner. The framework encompasses the data maintenance (labelling, structuring, cleaning and preprocessing), explorative tools and frameworks to implement, test and validate different AI models. Eventually the framework needs to archive the resulting AI models so they can be exported and adapted in diverse target systems (IoT platform, SCADA system and embedded hardware).