

# **Anomaly detection method based on the deep knowledge behind behavior patterns in industrial components. Application to a hydropower plant**

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## **Abstract-**

**This paper describes a new methodology that aims to cover a gap detected in the area of detection of anomalies and diagnosis of industrial component behaviors: there is a need of robust procedures compatible with dynamic behaviors and degradations that evolve over time. The method proposed is based on the creation of behavior patterns of industrial components using well-known unsupervised machine learning algorithms such as K-means and Self-Organizing maps (SOMs) as a starting point. An algorithm based on local Probability Density Distributions (PDD) of the clusters obtained is used to enhance the characterization of patterns. The joint use of these algorithms facilitates a new way to detect anomalies and the surveillance of their progress. The paper includes an example of an application of the method proposed for monitoring the bearing temperature of a turbine in a hydropower plant showing how this method can be applied in behavior and maintenance assessment applications. The results obtained prove the advantages and possibilities that the proposed methodology has on real world applications.**

**Index Terms-** Anomaly detection; pattern discovery; normal behavior characterization; maintenance assessment; self-organizing maps; k-means; probability density functions; hydropower plant

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