

Investigating the impact of sensors location on event detection tasks: A case of gaseous chemical detection

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Condition Monitoring

Abstract

In industries where environmental conditions are dynamic, the strategic placement of sensors is crucial for comprehending the behaviour of industrial equipment. Despite extensive discussions on Industry 4.0 and the Internet of Things (IoT), there is a notable gap in research regarding the optimal placement of sensors at the system level, a key factor for obtaining precise data for event identification. This paper addresses this gap by investigating the impact of sensor location on event detection processes, with a focus on chemical detection as a case study, leveraging an available online dataset.

In scenarios employing an open sampling system, where chemically sensitive elements are directly exposed to the monitored environment, the identification and monitoring of gaseous substances become challenging due to dispersion mechanisms. Successful execution of this dynamic task relies on the integration of suitable algorithms and well-designed experimental protocols, including operating conditions and sensor placement, contributing to the creation of a robust dataset. Employing Deep Convolutional Neural Networks (DCNN) and Decision Tree (DT) methods, detection models were developed using a dataset collected from sensors positioned at five different locations.

The results underscore the critical role of sensor location in enhancing the precision of system monitoring. Consequently, this paper proposes an approach aimed at determining the optimal combination of sensor placements to achieve a balance between accuracy and deployment costs.

