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Dependable Outlier Detection in Harsh Environments Monitoring Systems

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Abstract

Environmental monitoring systems are composed by sensor networks deployed in uncertain and harsh conditions, vulnerable to external disturbances, posing challenges to the comprehensive system characterization and modelling. When unexpected sensor measurements are produced, there is a need to detect and identify, in a timely manner, if they stem from a failure behavior or if they indeed represent some environment-related process. Existing solutions for fault detection in environmental sensor networks do not portray the required sensitivity for the differentiation of these processes or they are unable to meet the time constraints of the affected cyber-physical systems.

We have been developing a framework for dependable detection of failures in harsh environments monitoring systems, aiming to improve the overall sensor data quality. Herein we present the application of an early framework implementation to an aquatic sensor network dataset, using neural networks to model sensors' behaviors, correlated data between neighbor sensors, and a statistical technique to detect the presence of outliers in the datasets.

Keywords

Dependability   Data quality   Outlier detection   Machine learning   Neural networks   Water monitoring

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Notes

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