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A Machine Learning Approach for Anomaly Detection in Environmental IoT-Driven Wastewater Purification Systems

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Abstract : The main goal of this paper is to present a solution for a water purification system based on an Environmental Internet of Things (EIoT) platform to monitor and control water quality and machine learning (ML) models to support decision making and speed up the processes of purification of water. A real case study has been implemented by deploying an EIoT platform and a network of devices, called Gramb meters and belonging to the Gramb project, on wastewater purification systems located in Calabria, south of Italy. The data thus collected are used to control the wastewater quality, detect anomalies and predict the behaviour of the purification system. To this extent, three different statistical and machine learning models have been adopted and thus compared: Autoregressive Integrated Moving Average (ARIMA), Long Short Term Memory (LSTM) autoencoder, and Facebook Prophet (FP). The results demonstrated that the ML solution (LSTM) out-perform classical statistical approaches (ARIMA, FP), in terms of both accuracy, efficiency and effectiveness in monitoring and controlling the wastewater purification processes.

Keywords : environmental internet of things, EIoT, machine learning, anomaly detection, environment monitoring
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