

A comparison of machine learning classifiers for leak detection and isolation in urban networks

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ABSTRACT

Leak detection and isolation (LDI) is a problem of interest for water management companies and their technical staff. Main reasons for this are that early detection of leakages can reduce dramatically (1) water losses in urban networks and (2) the environmental burden due to wasted energy used in the system supply [1]. Water leakage can become a very complex problem, due to the lack of information about the water system and because a leak might not be easily detected on-sight. Such leaks typically appear due to ageing pipes and networks' shortcomings; it is estimated that water losses in urban networks for example, can reach percentages up to 40%. Therefore, any diagnostic tool that could help in such task are valuable for engineers and managers.

Soft computing tools have shown to be valuable tools for researchers in different fields. Such tools range from machine learning and evolutionary algorithms to rule-based and knowledge-based systems. For example, supervised machine learning techniques have been used with success in complex problems, for binary and multi class classification [2]. This is useful in order to detect different faulty scenarios in complex systems using for example, on-line data from SCADA systems. Therefore, their usage for LDI is appealing for the research community.

The aim of this paper is twofold: on the one hand, to provide a review on soft computing techniques used for LDI in urban networks. On the other hand, to identify strengths and drawbacks among different machine learning techniques for such task in real-time acquisition scenarios. Techniques under study are principal component analysis (PCA), support vector machines (SVM) and relevance vector machines (RVM). With the provided study, it will be possible to state a common benchmark in order to evaluate different supervised machine learning techniques for LDI in urban networks and therefore encouraging new soft computing developments for such task.

REFERENCES

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