

Interpretation of horizontal displacement time series recorded in concrete dams based on support vector regression models

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ABSTRACT

The assessment of the structural safety and serviceability of concrete dam is often supported by the use of models. The analysis and interpretation of the observed structural responses, such as displacements, is usually performed through the comparison with values obtained by statistical models, mainly multiple linear regression models, which are also known as quantitative interpretation models.

Nowadays, several new machine learning models have been used for the assessment of the concrete dams' behaviour, such as support vector machine, boosted regression trees and random forest. These models have been object of intense research and recent development, due to their ability to adjust to systems and processes of diversified and complex nature. In practice, whenever a large amount of monitoring data is available it is possible to use machine learning models, which are developed from the history data of previous loads and structural response of the concrete dam.

The main aim of this research is to assess the performance of support vector regression models applied to the interpretation of the Salomonde dam's structural behaviour, which is a large concrete dam in operation in Portugal. From the variables measured by the monitoring system of Salomonde dam, the present study considered data from horizontal displacements only, being the temperature and the reservoir water level the main loads used as inputs for the machine learning models. The main results are presented and discussed in order to demonstrate the reliability of these models when implemented on the structural safety control of concrete dams.

Keywords: Safety Control of Concrete Dams, Dam Monitoring System, Support Vector Regression Models, Dam Behaviour Models