# Data-driven modelling for flood defence structure analysis

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***Keywords:*** *Anomaly detection, dike monitoring*

Instability of flood defence structure (dam, dike, levee, embankment) can be the result of heavy external conditions (high water levels, precipitations, drought, etc.). Detection of dike weakness is usually carried out by visual control. With an increasing number of failures of flood defence structures, automatic monitoring is an urgent necessity. It requires installation of sensor networks inside the structures and development of models for dike stability evaluation.

In this paper authors present a data-driven modelling approach for detection of anomalies in flood defence structures equipped with sensors. An auto-regressive (AR) linear model and feed-forward neural network (FFNN) were applied for modelling a transfer function between the sensors.

This approach has been validated on a dike in Boston, UK – one of the pilot sites of the *UrbanFlood* project – that showed both normal and abnormal sensor behaviour. Comparison of the linear and nonlinear models showed that both AR and FFNN models can identify abrupt changes and trend change in signal behaviour, but constructed non-linear model is more accurate. Decision on model selection depends on model accuracy requirements.

The suggested model-based anomaly detection approach will extend the functionality of *UrbanFlood* Early Warning System (www.urbanflood.eu), in particular the Artificial Intelligence (AI) component, which aims to process raw data and to detect anomalies in dike behaviour.

This work is supported by the EU FP7 project *UrbanFlood*, grant N 248767.