



# Leak Quantification in Water Pipeline Systems

A toolkit for leak position detection and leak size estimation

## Summary

According to The Auditor General of WA, leaks in water pipeline systems are estimated to cost billions of dollars in the 2012-13 financial year.

Machine learning can be used for leak quantification to predict the size and position of leaks using network structure and flows.

Leak quantification operates on a precinct or urban catchments using a snapshot of pipeline system at a single time.

The information produced by this technique can be used by water utilities for leak management.



## Capabilities

### Model

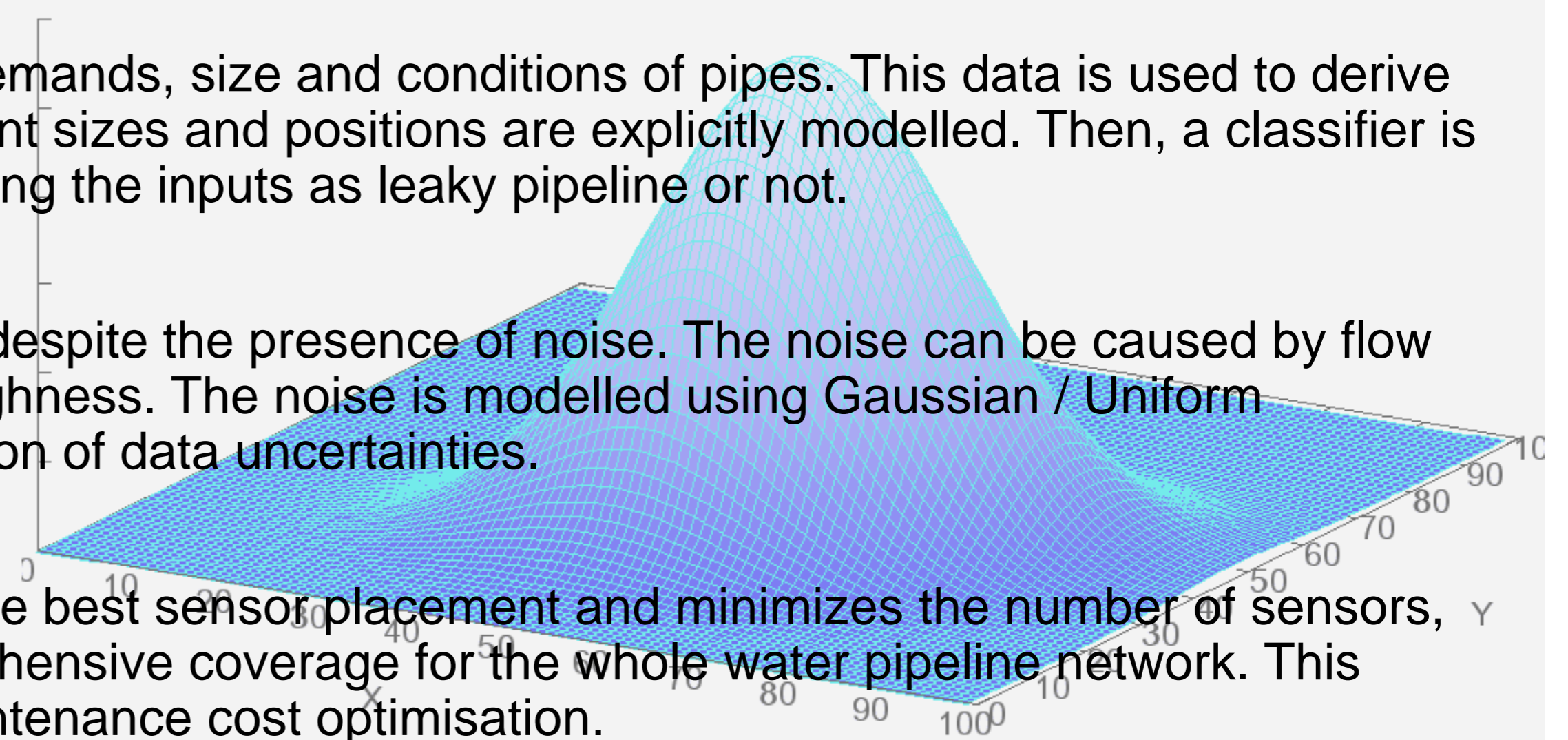
The input of this technique is a network topology, demands, size and conditions of pipes. This data is used to derive flows and pressures in the network. Leaks of different sizes and positions are explicitly modelled. Then, a classifier is trained to detect the presence of leaks by categorising the inputs as leaky pipeline or not.

### Noise

This technique is able to make accurate prediction despite the presence of noise. The noise can be caused by flow sensor inaccuracies or unknowns such as pipe roughness. The noise is modelled using Gaussian / Uniform distribution algorithms that can simulate real condition of data uncertainties.

### Minimizing sensor provision

The modelling tool helps the designers to choose the best sensor placement and minimizes the number of sensors, yet still able to provide accurate results and comprehensive coverage for the whole water pipeline network. This approach is important for sensor provision and maintenance cost optimisation.



- network structure
- pipe type
- water demand



- feature selection
- noise handling



classification



- leak position
- leak size