Quantifying the Expected Value of Data

Applications to Decision Making Under Uncertainty

The Alan Turing Institute

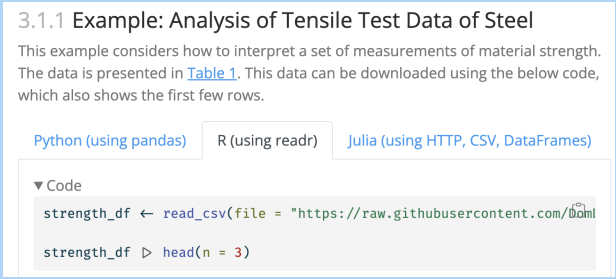
Decision Support for the Management of the Built Environment

There are an increasing number of techologies for data collection from engineering assets - but how much data is required, how good does it need to be, and how much should engineers be willing to pay for it?

These questions can be answered by explicitly linking the models used by engineers to the underlying decision problems that are driving them. Using 'Value of Information' (VoI) analysis, it is possible to understand **how** and **to what extent** prospective **data** is expected to **support decision making**.

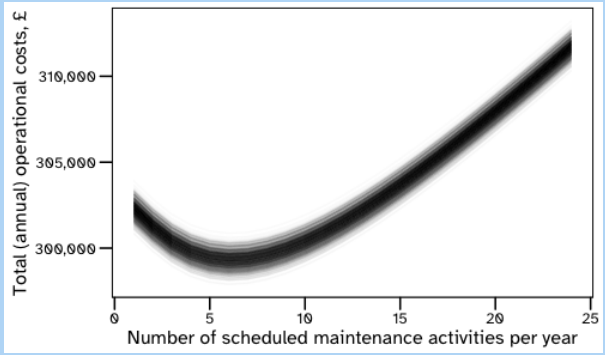
The Alan Turing Institute are developing a computational document, with applied examples:

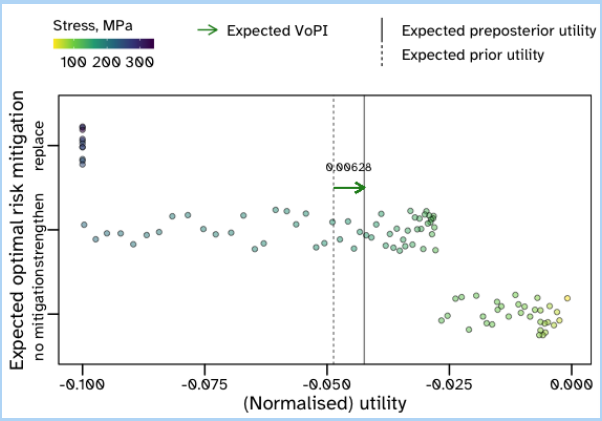
- A strain gauge has stopped functioning in my bridge - should I replace it?
- How much should I be willing to pay for a smart meter?



Building Energy Systems (RIGHT):
When scheduling upcoming maintenance contracts, uncertainty regarding the performance of heating systems can be reduced using data from smart meters.

This analysis can quantify the value that this data provides, in the context of solving this problem.





Structural Integrity Management (LEFT):
Repairs are planned at engineering facilities during shutdowns. Data from structural health monitoring systems can reduce uncertainty in estimates of operational loads.

A sensitivity analysis shows how the expected value of such data is especially large when the prior decision problem is most challenging.

Funding & Partners

This work is supported by Wave 1 of The UKRI Strategic Priorities Fund under the EPSRC Grant EP/W006022/1, particularly the Ecosystems of Digital Twins theme within that grant and The Alan Turing Institute.

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