Technology Strategy Board
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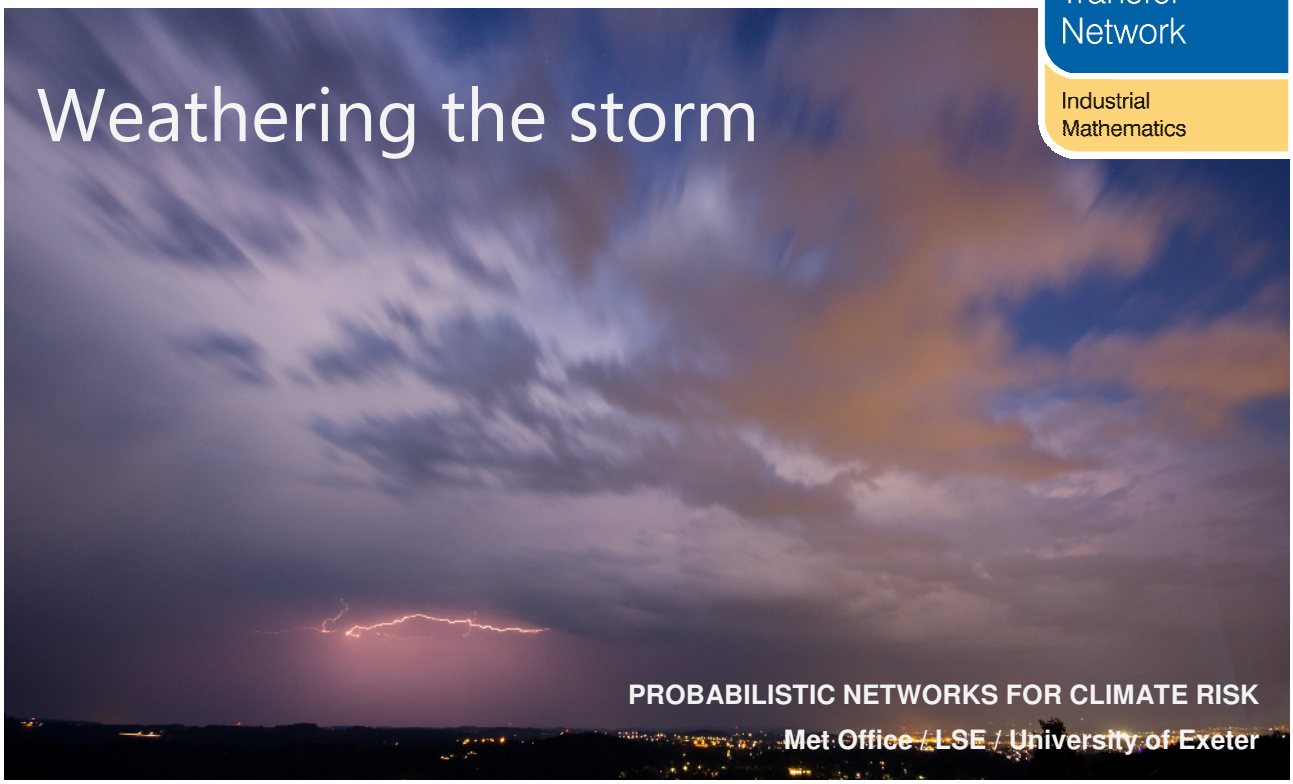
Knowledge Transfer Network
Industrial Mathematics

Weathering the storm



PROBABILISTIC NETWORKS FOR CLIMATE RISK

Met Office / LSE / University of Exeter

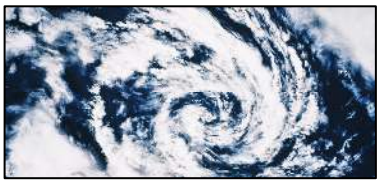
The need

In order for decision makers to manage the risks posed by climate change, climate model projections need to be communicated clearly. Placing climate risk in the context of other risk factors is essential to understand the relative importance of climate change and how climate information ultimately affects a decision. However, there is often a mismatch between the information contained within climate model projections and that which is needed by decision makers.

Given that probabilistic information is now available within the UK, e.g. UK Climate Projections '09 (UKCP09), and mindful of the need to communicate such information appropriately, tools must be developed which are tailored to specific climate change adaptation decisions.

The outcomes

The project helped to further the understanding of the role that Bayesian Networks can have within climate impacts research. The results of a case study with two hospitals suggest that the tool can be used as an instrument for consultation, highlighting system sensitivities and providing a conceptual framework for considering the many factors that impact climate adaptation decisions.



The project allowed the student to gain an improved understanding of the decision-making process in a climate change context. The student developed skills in building Bayesian Networks using Netica and gained experience in structuring interviews and communicating with stakeholders. Working with members of the Climate Impacts Team and other members of the Met Office enabled the student to appreciate the range of issues being addressed and gain insight into the way that the Met Office and the Hadley Centre conduct research and interact with businesses and the wider research community.

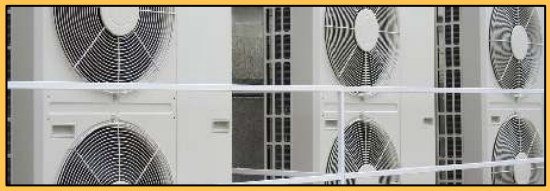
"The work that Joe has done has been very valuable ... The case study helped to identify the circumstances under which the Bayesian Network is a useful tool, and allowed us to engage with decision makers in a new way."

Doug McNeall
Met Office

Technical summary

A Bayesian Network (BN) is a graphical model with an underlying probabilistic framework, which characterises and quantifies an outcome of interest, and the variables and their interactions associated with this outcome. They allow for the explicit quantification of risk and uncertainty combining evidence from diverse sources incorporating subjective beliefs and objective data.

In order to determine how they might aid climate change adaptation decisions, a case study applying the tool to a specific decision problem was found. The project focused on the UK Health Infrastructure and more specifically on the cooling options available to hospitals and health facilities to cope with potential future temperature increases. The case study centred on consultations with two UK hospitals; Guy's and St Thomas' Foundation Trust in central London and the Royal Devon and Exeter Foundation Trust in the southwest.



Using the software Netica, a BN for a typical capital project at both of the hospitals was built and the way that probabilistic information from UKCP09 can be combined with observed climate data was investigated. In a simple illustrative example, it can be shown that current evidence indicates an increased risk of exceeding a crucial temperature threshold (28℃) within hospital buildings towards the end of the century.

"Working on the internship at the Met Office allowed me to engage directly with decision-makers who are faced with decisions that are sensitive to climate model information. The experience has given me valuable insights that I can apply in my PhD research."

Joseph Daron
University of Exeter

"Joe has gained valuable experience and expertise regarding the relative roles of different information sources when making practical decisions influenced by climate change. This will be of benefit in his PhD research and beyond."

David Stainforth
London School of Economics and Political Science

This project was part of the programme of industrial mathematics internships managed by the Knowledge Transfer Network (KTN) for Industrial Mathematics. The KTN works to exploit mathematics as an engine for innovation. It is supported by the Technology Strategy Board, in its role as the UK's national innovation agency, and the Engineering and Physical Sciences Research Council, in its role as the main UK government agency for funding research and training in engineering and the physical sciences.

EPSRC
Engineering and Physical Sciences Research Council

Project Details

Partners
Met Office
LSE and University of Exeter

Project investment
£13,000

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