

# How do Bayesian Networks support impact-based forecasting for informed decision-making?



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## Introduction

- Impact-based forecasting (IBF) is pivotal for disaster risk management. It empowers decisions that anticipate and reduce damage and loss of life from natural hazards.
- IBF relies on risk matrices. These matrices evaluate probabilities or impact figures for specific events, such as floods.
- However, they often miss out on considering conditional elements, potential interventions, and essential scenarios, especially the probable outcomes of different actions [1].
- Enter the Bayesian Network (BN): a directed graphical model that encapsulates variables and their conditional probabilistic interconnections.

## Methods

- The figure 1 illustrate the method for creating a BN model. This model can be broadened to include inputs and applications crucial for decision-making.
- The presented BN model leverages insights from GPT-4V using the Python library pgmpy.

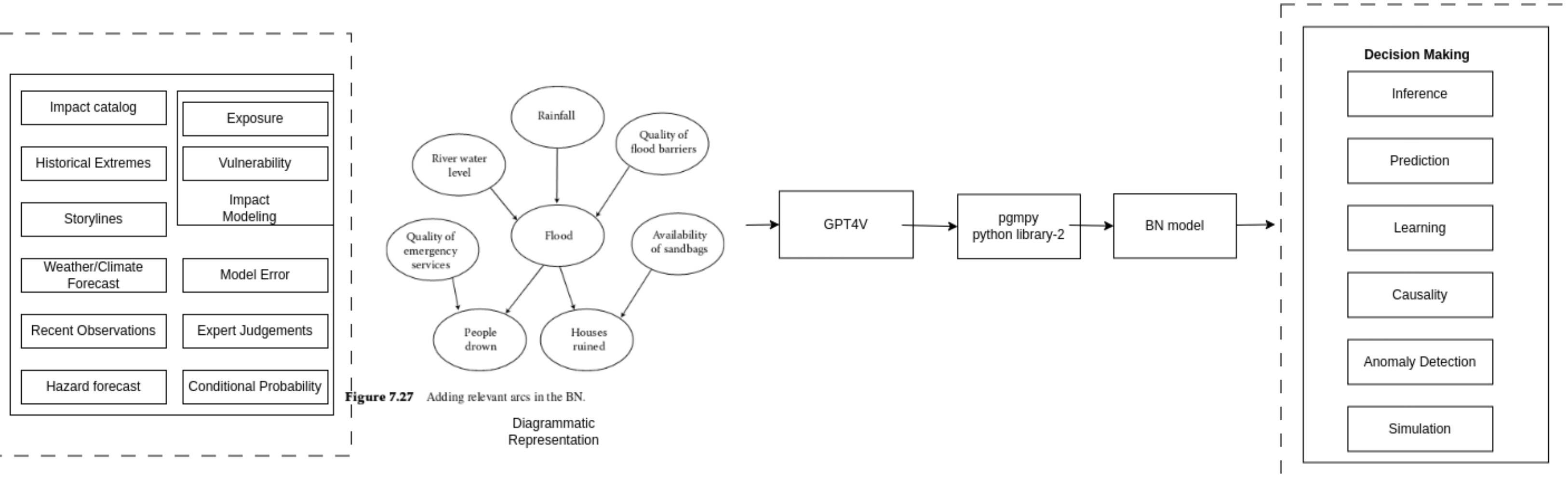


Figure 1: Steps for BN generation using GPT-4V[2] and the Python library pgmpy[3]. The test image is adapted from Fenton and Neil [1].

## Results

- Our Jupyter Notebook on GitHub provides preliminary findings on using BN for carry out analysis for antciaptory action against flood hazards.
- We are expanding the study to widen the applications of our findings.

## Reference

[1] Norman Fenton and Martin Neil. *Risk assessment and decision analysis with Bayesian networks*. CRC Press, 2018.  
[2] OpenAI. GPT-4 technical report, 2023. <https://arxiv.org/abs/2303.08774>.  
[3] Ankur Ankan and Abinash Panda. pgmpy: Probabilistic graphical models using python. In *Proceedings of the 14th python in science conference (scipy 2015)*, volume 10. Citeseer, 2015.  
[4] Nassim Nicholas Taleb. *Skin in the game: Hidden asymmetries in daily life*. Random House, 2018.

Current IBF practices, lacking in addressing un-  
certainty, diverse views, and transparency, miss  
the 'skin in the game'[4]. Integrating Bayesian  
Networks with GPT-4V/LLM could enhance IBF



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