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

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Introduction

- Impact-based forecasting (IBF) aims to support risk-oriented decisions in disaster risk management by promoting anticipatory actions that minimize damage and loss of life from natural hazards.
- A Bayesian Network (BN) is a directed graphical model representing a set of variables and their conditional probabilistic dependencies.
- IBF essentially uses risk matrices, which are products of the probability of impact and the extent of impact, represented as unconditional probabilities or impact numbers for events, like a flood event.
- However, it fails to consider conditional factors, potential interventions, and critical questions, such as the likelihood of significant consequences under different actions [2].

Methods

Method used for generating BN model, which can be extended with inputs and output applications for decision making.

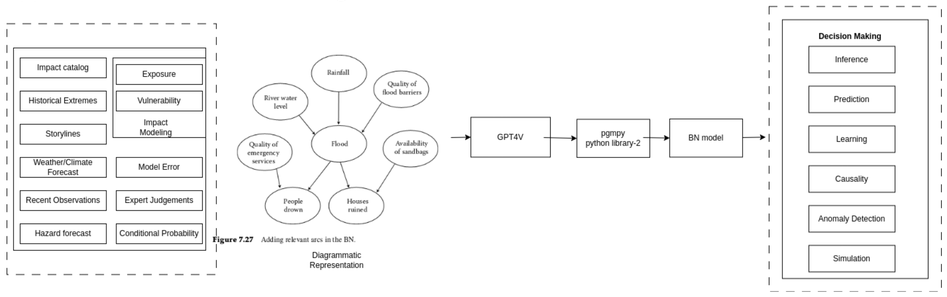

Figure 1: BN generation steps, using GPTV4[3] and Python library pgmpy[1], test image given is from [2]

Results

- The Jupyter Notebook in Github shows the some of preliminary results related to the usage of simple Flood hazard anticipation and BN generation
- Study is ongoing to extend the application

Reference

[1] 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.

[2] Norman Fenton and Martin Neil. *Risk assessment and decision analysis with Bayesian networks*. CRC Press, 2018.

[3] OpenAI. Gpt-4 technical report, 2023.

Current **IBF** practices inadequately address **uncertainty, diverse perspectives, and process transparency**, leading to a lack of **'skin in the game'**. Integrating **Bayesian Networks** coupled with **GPT-4V/LLM** could revolutionize IBF.

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Github repo project
nishadhka/bn-ibf