06/17/2023

MET CS 767 Assignment 6: Bayesian Networks

*Alessandro Allegranzi*

Create your own application of a Bayesian network, like the “sprinkler” problem in the notes. You can do this by hand, via a Python program, or using an online Bayesian network tool.

Please leave the gray text and the headings unchanged etc.

# Requirements for your application

Supply the requirements, including the nature of its inputs and that of its outputs.

The following Bayesian Network can help in understanding how different factors influence voting behavior in an election, aiding in the analysis of voter decisions and the development of political strategies.

**Events (Nodes):**

1. **Political Affiliation (PA)**: The political leaning of a voter (e.g., 0: Conservative, 1: Liberal, 2: Independent).
2. **Economic Outlook (EO)**: The voter's perception of the economic future (0: Positive, 1: Negative).
3. **Social Issues (SI)**: The importance of social issues to the voter (0: High, 1: Low).
4. **Media Influence (MI)**: The level of influence media has on the voter's decision (0: High, 1: Low).
5. **Actual Vote (AV)**: The actual voting decision (0: Conservative, 1: Liberal, 2: Independent).

**Dependencies:**

* **Political Affiliation** influences **Actual Vote**.
* **Economic Outlook** influences **Actual Vote**.
* **Social Issues** influences **Actual Vote**.
* **Media Influence** influences **Actual Vote**.

**Requirements:**

* **Inputs**:
  + **Political Affiliation**: An integer representing the political leaning of a voter.
  + **Economic Outlook**: An integer representing the voter's perception of the economic future.
  + **Social Issues**: An integer representing the importance of social issues to the voter.
  + **Media Influence**: An integer representing the level of influence media has on the voter's decision.
  + Observations of any of the other variables (optional), e.g., if the economic outlook is known.
* **Outputs**:
  + The probability distribution of the **Actual Vote**, given the political affiliation, economic outlook, social issues, media influence, and any other available observations.

# Diagram

Provide a figure like the one in the notes for the Bayesian network.

A diagram of a political process

Description automatically generated

# Example 1

Give an example of an input and the resulting outputs, with an explanation of the computation.

your response replaces this

# Example 2

Give an example of an input and the resulting outputs, with an explanation of the computation.

your response replaces this

# Scaling

Imagine a real-world Bayesian network built to assess the economic impact of connected events, and implemented as in the your example. What would the main obstacles be to its practical development and use? Avoid generalities about Bayesian networks; concentrate on your application and its extrensions.

your response replaces this

# References

[1] “Bayesian Network”. *Pgmpy Docs*. https://pgmpy.org/models/bayesiannetwork.html

# Evaluation

