

Computer Practicum for discrete Bayesian Networks

In this practicum you will get familiar with the basic concepts of discrete Bayesian networks (BNs). The practicum will help you learn how to create and manipulate them with the software Netica.

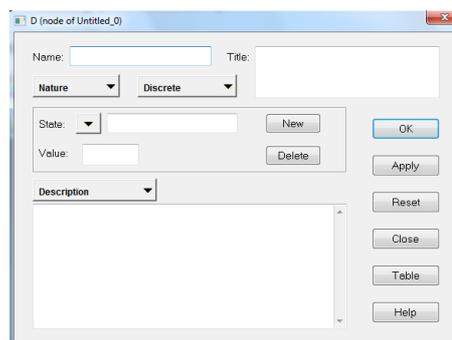
Downloading Netica

The free version of Netica can be downloaded from .

<https://www.norsys.com/download.html>

Homework: Setting up the structure of a discrete BN in Netica for a simple example on flooding probabilities.

1. Open Netica, select the “Limited Mode” version. Click on the “New Net” knob  and save e.g. as “SimpleFlooding.neta”
2. Create nodes for each of the six variables *seismicity*, *rain*, *overtopping*, *breaching*, *piping* and *flooding*.
 - Select the “add node” button (yellow ellipse ) from the standard toolbar and subsequently left clicking on the desired location inside the Netica window. Name the nodes according to their variable names.
 - select a node type “Nature”, “Continuous”.
3. Define each variable to have three states *low*, *medium* and *high*. You can do that by double-click a particular node and typing in State and then click “New”. If you make one node you can copy paste all other nodes and change the names.

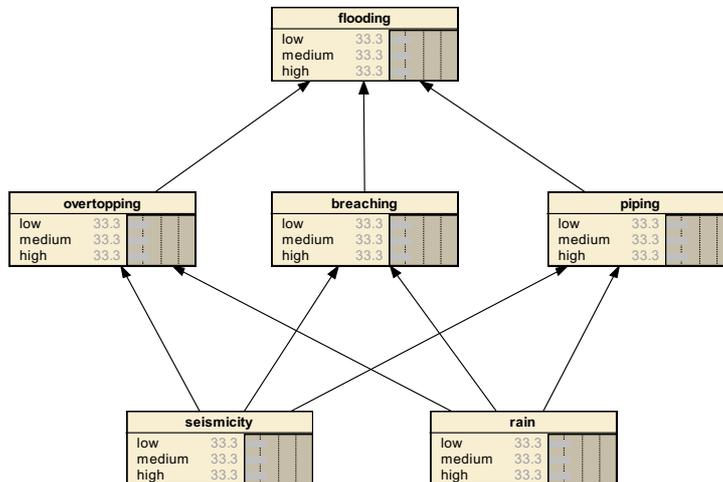


4. Make the following assumptions to characterise the dependencies between the variables:
 - (i) *Seismicity* and *rain* are independent random variables. They both influence *overtopping*, *breaching* and *piping*.
 - (ii) *Overtopping*, *breaching* and *piping* are (pairwise) conditionally independent given *seismicity* and *rain*. They influence *flooding*.

(iii) *Flooding* is conditionally independent of both *seismicity* and *rain* given *Overtopping*, *breaching* and *pipng*.

➤ In Netica introduce the required arcs by selecting the “arc” button

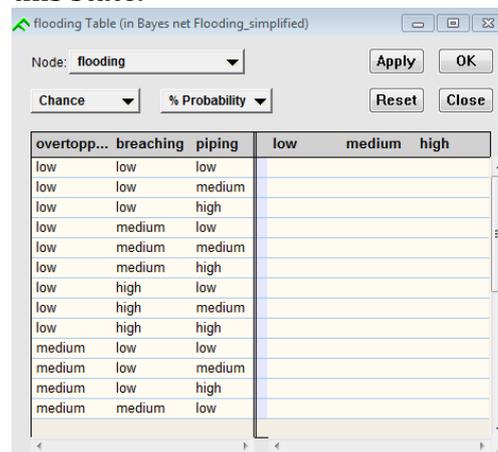
from the standard toolbar . Click on a “parent” node and dragging the arc to the “child” node. The model looks similar to the one below



In class: Quantify the BN

1. Use your own expertise to estimate the (conditional) probability tables for all nodes and compute all prior distributions with Netica

➤ Go to the *Table* of each node and modify each probability entry. Simply select an entry and type in your probability estimate for this state.



➤ Once all tables are filled, select “Compile” (yellow lightning flash ) to obtain the prior probabilities of all nodes.

2. Explore different scenarios by computing posterior probabilities

➤ “Set Evidence” by clicking on a particular state of the node.