

Lecture Graphical Models

https://ml01.zrz.tu-berlin.de/wiki/Main/SS09_GraphicalModels

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Sheet 6

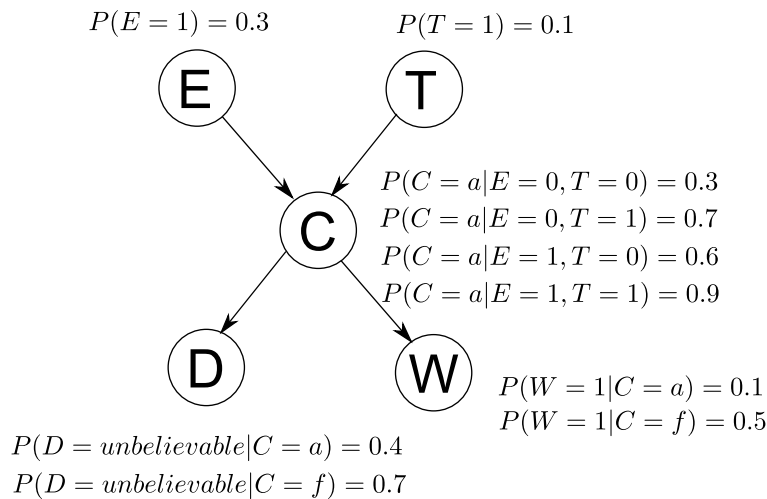
Due: 2 June 2009

1. Message passing by hand

Take a look at the Election09 BN below. It consists of 5 binary random variables:

- economy $E \in \{0, 1\}$ where 1 represents improving and 0 standstill/decreasing
- terrorist attack $T \in \{0, 1\}$
- chancellor $C \in \{angela, frank\}$
- national debt $D \in \{extreme, unbelievable\}$
- restrictive weapon law installed $W \in \{0, 1\}$

Please infer the posteriors $P(E = 1|W = 0)$, $P(T = 1|W = 0)$, $P(C = a|W = 0)$ and $P(D = 1|W = 0)$ by carrying out belief propagation **by hand**. Represent the BN as a factor graph, use W as the root and calculate all messages between cliques and variables. Hint: To include the evidence $W = 0$, you may want to use an additional factor ϕ on variable W which clamps W to the observed value, i.e., $\phi(W = 0) = 1$ and $\phi(W = 1) = 0$.



2. Viterbi decoding implementation

Please implement the Viterbi algorithm (in C++ or Java). Test your implementation for the imprisoned banker scenario of exercise 2 of sheet 5. In particular, calculate the most probable weather sequences for the following observation sequences for days 2-7:

- $\{C, HD, C, HD, C, HD\}$
- $\{C, C, C, C, C, C\}$
- $\{HD, HD, C, C, HD, HD\}$
- $\{HD, SD, C, SD, HD, SD\}$
- $\{SD, SD, C, SD, SD, HD\}$

Please send your program to lang@cs.tu-berlin.de before the lecture and bring your results for the 5 observation sequences to the tutorial lesson.