Assignment 07

Gerald Wakolbinger

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1 Task01

1.1 Question01

The bayes' net was structured according to the information given. For the random variables PeterAlarmFails and TrainStrike setting the probabilities is straightforward. JohannaLate is only dependet on TrainStrikes whereas PeterLate is dependent on TrainStrike as well as PeterAlarmFails. As the conditional probabilities for PeterLate and JohannaLate are given for all possible combinations where PeterLate and JohannaLate are true, the rest of the missing probabilities can deduced, as they have to add up to 1 in total. For example the probability of PeterLate equals false given both TrainStrike equals true and PeterAlarmFails equals true, is equal to 1 - the probability of PeterLate equals true given both of the same values of TrainStrike and PeterAlarmFails.

1.2 Question02

The probability of Johanna or Peter being late is the probability for those random variables given no prior information regarding their parent variables. Therefore the probability can be just read from the generated bayes' net.

1.3 Question03

The probability we are searching for is: $P(JohannaLate = true \mid PeterAlarmFails = true)$ however as JohannaLate is independent of PeterAlarmFails the probability does not change in comparison to Question 02 which means $P(JohannaLate = true \mid PeterAlarmFails = true) = P(JohannaLate = true)$

1.4 Question04

The probability we are searching for is: $P(JohannaLate = true \mid PeterLate = true)$ even though PeterLate and JohannaLate are not directly dependent on each other, PeterLate = true increases the probability that a TrainStrike happened prior and as our certainty of a TrainStrike happening is increasing this also increases our certainty of JohannaLate being true. Therefore: $P(JohannaLate = true \mid PeterLate = true) > P(JohannaLate = true)$

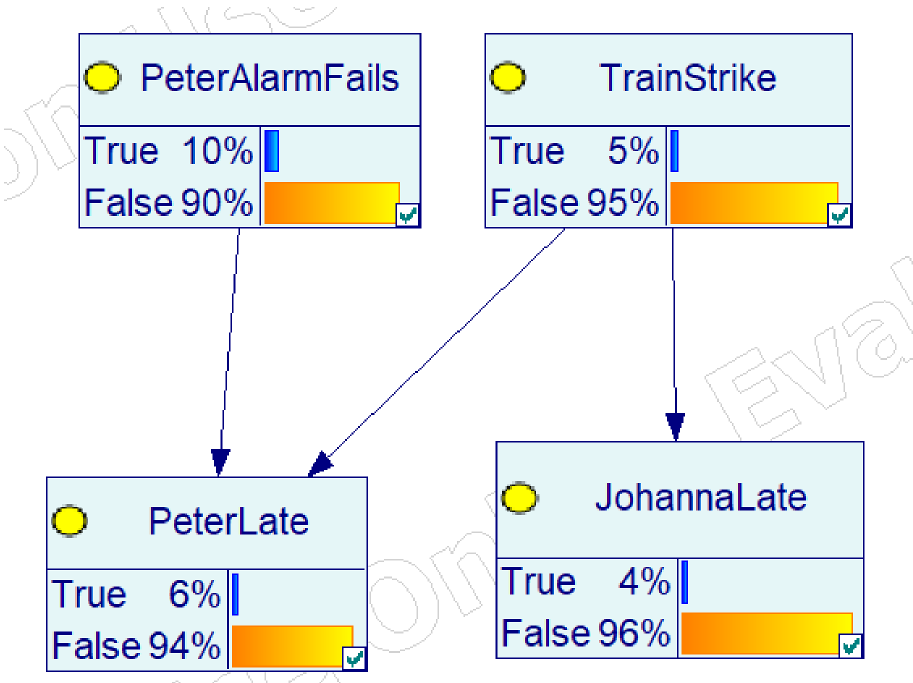

Figure 1: Q1 Structure of the BayesNet

1.5 Question04

The probability we are searching for is: $P(JohannaLate = true \mid PeterLate = true, PeterAlarmFails = false)$ the probability $P(JohannaLate = true)$ basically only increases if the probability $P(TrainStrike = true)$ increases. As the probability $P(PeterLate = true|PeterAlarmFails = false, TrainStrike = true) > P(PeterLate = true|PeterAlarmFails = false, TrainStrike = false)$ we know that even though Peter might just be late for unknown reasons, it is more likely that an actual TrainStrike occured and if as the certainty of a TrainSTrike occuring increases, so does the certainty of JohannaLate = true aswell.

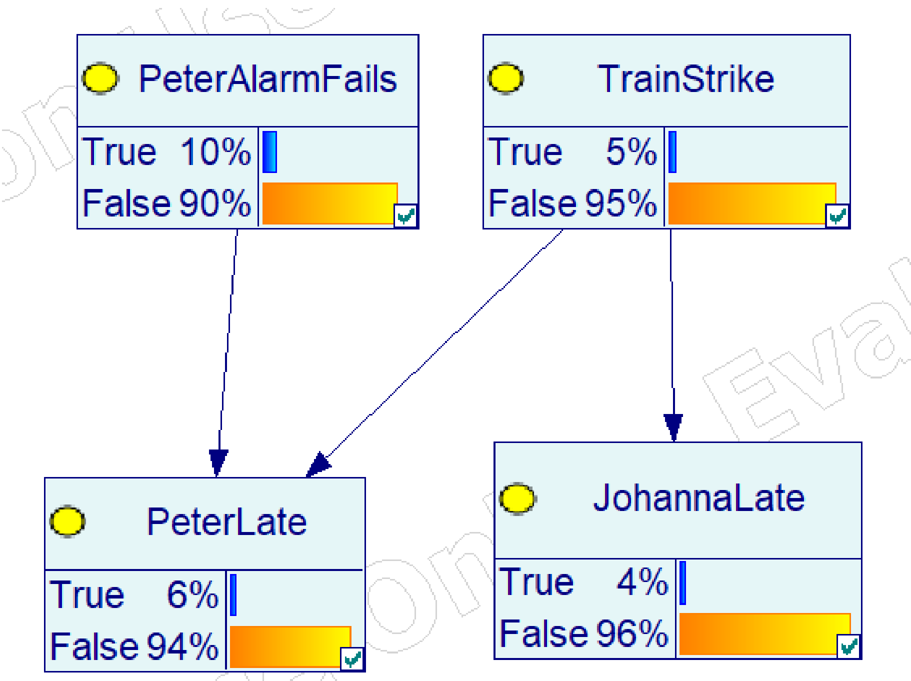

Figure 2: Q2 probability of Johanna or Peter being late

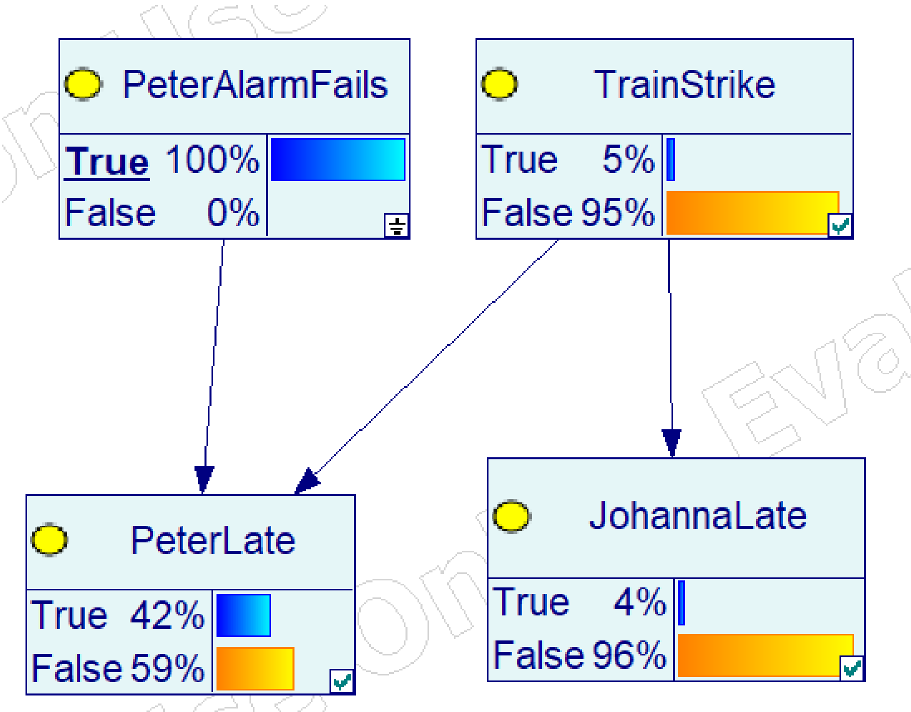

Figure 3: Q3 probability of Johanna being late given Peter's alarm doesn't work

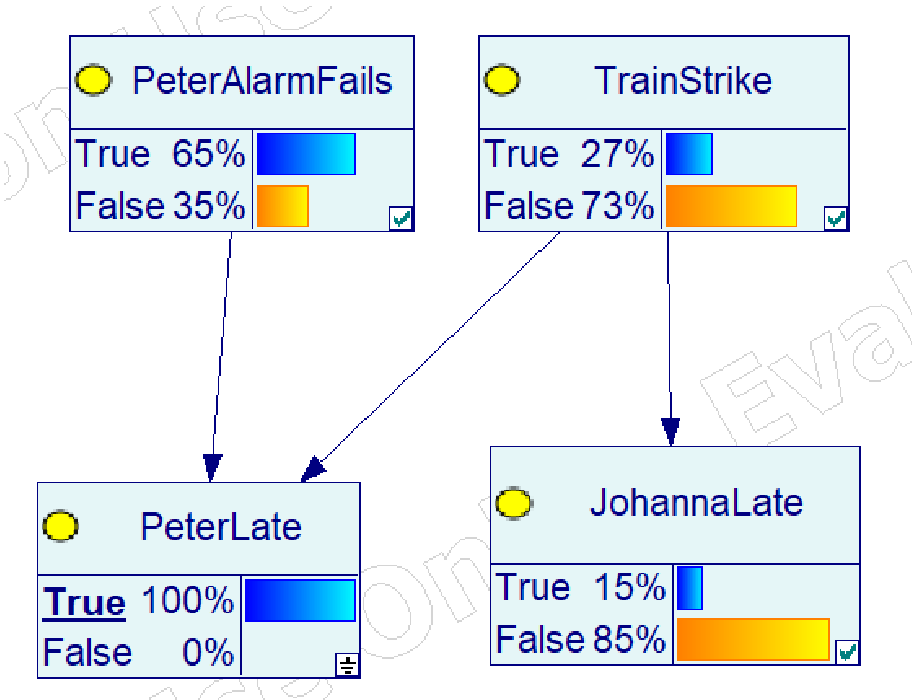

Figure 4: Q4 probability of JohannaLate being true, given PeterLate being true

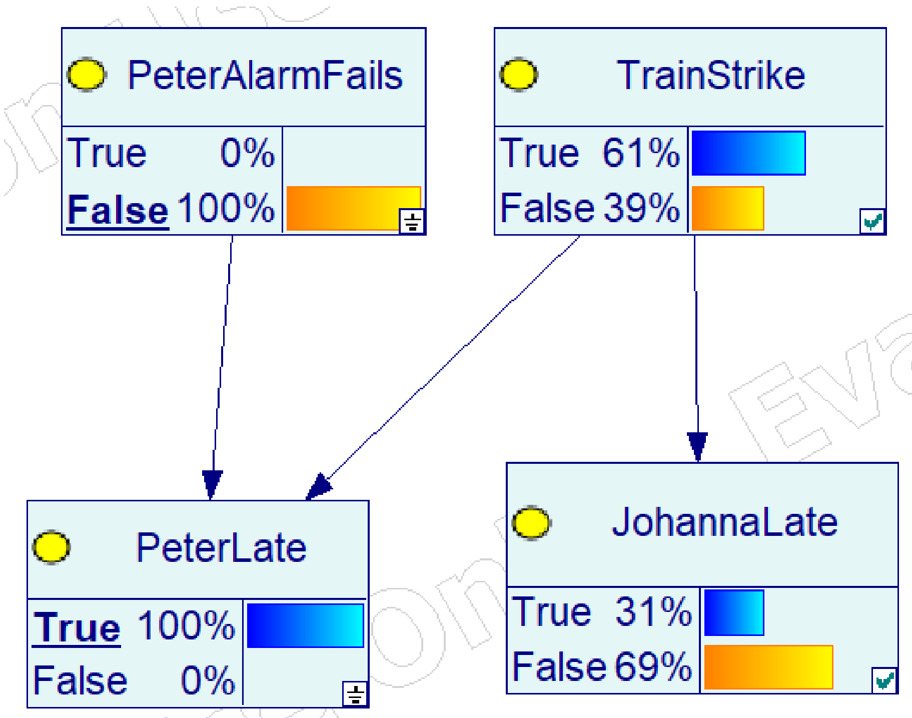

Figure 5: Q5 probability of JohannaLate being true, given PeterLate being true and PeterAlarmFails being false