

Machine Learning

Exercise 9

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1 Probabilistic modelling

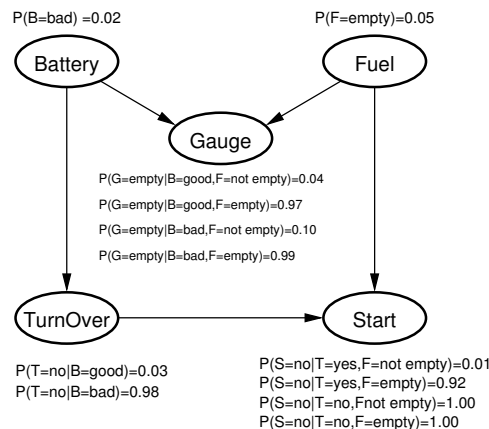
Formulate a probabilistic model for the price of used cars (e.g. on autoscout24 or so).

("Formulating a probabilistic model" includes: 1) which random variables exist, 2) how do they depend on each other: of which type are the conditional probability distributions and which parameters do they have.)

Let's assume your model is better than anybody else's model. How could you make money out of it?

2 Inference by hand

Consider the Bayesian network of binary random variables given below, which concerns the probability of a car starting.



Calculate $P(\text{Fuel}=\text{empty} \mid \text{Start}=\text{no})$, the probability of the fuel tank being empty conditioned on the observation that the car does not start. Do this calculation by hand. (First compute the joint probability $P(\text{Fuel}, \text{Start}=\text{no})$ by eliminating all latent (non-observed) variables except for Fuel.)

3 Inference by constructing the full joint

Consider the same example as above. This time write an algorithm that first computes the full joint probability table $P(S, T, G, F, B)$. From this compute $P(F|S)$.

4 Constructing a Bayes net

On slide 08:12 general rules for determining $Indep(X, Y|Z)$ are given. Use these to construct the Bayesian network for the car example when random variables are added in the order S, T, G, F, B (see slides 08:8,9).