References

* https://machinelearningmastery.com/introduction-to-bayesian-belief-networks/
* <https://www.microsoft.com/en-us/research/wp-content/uploads/2016/02/tr-95-06.pdf>

“Bayesian networks are a type of probabilistic graphical model comprised of nodes and directed edges.”

We have to design a Bayesian Network given relationships between variables and use them to calculate probabilities.

We develop a model that preserves the known conditional dependence between random variables and conditional independence in all other cases. We design probabilistic graphical model that explicitly captures the known conditional dependence with directed edges in a graph model. All missing connections define the conditional independencies in the model. Using this model, we capture both conditionally dependent and conditionally independent relationships between random variables.

Now we can either assume that all the random variables are independent (or) with some conditional dependence (or) develop a fully dependent model.

Bayesian belief networks are one example of a probabilistic model where some variables are conditionally independent.

Nodes: Random variables in a graphical model.

Edges: Relationships between random variables in a graphical model.

Independence refers to a random variable that is unaffected by all other variables.

A dependent variable is a random variable whose probability is conditional on one or more other random variables.

Conditional independence describes the relationship among multiple random variables, where a given variable may be conditionally independent of one or more other random variables. This does not mean that the variable is independent instead, it is a clear definition that the variable is independent of specific other known random variables.

A probabilistic graphical model, such as a Bayesian Network, provides a way of defining a probabilistic model for a complex problem by stating all of the conditional independence assumptions for the known variables, whilst allowing the presence of unknown (latent) variables.

The model will help us determine relationships in between the random variables.

Once prepared , it can be used for reasoning, which is achieved via inference with the model for a given situation. For example, the outcome for some events is known and plugged into the random variables. The model can be used to estimate the probability of causes for the events or possible further outcomes.

So the network has been design considering the random variable as independent of each other

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