

10.1 Directed Acyclic Graphs and Graphical Models

- a)
 - directed acyclic graphs consist of nodes which represent random variables and directed links representing the relationships between those random variables
 - links reach from one node, called *parent*, to another node, the *child* which is statistically dependent of its parents (with probability distribution $P(x_i | \text{parents}(x_i))$)
- b)
 - conditional independence means that two or more random variables are statistically independent, iff another event becomes true
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- c)
 - there are several possibilities, e.g. the following: F, E, B, A, D, H, C, G
- d)
 - factorisation: $P(X) = P(E) P(F) P(B) P(A|F) P(D|F, E, A) P(H|B, A) P(C|F, H) P(G|A, H)$
- e)
 - the Markov blanket consists of all parents, children and children's parents: F, H, D, G, E, B
- f)
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10.3 Construction of a DAG

- a)
 - the figure below shows a DAG based on the given random variables
 - the event *Alarm* can be caused by *Burglary* and *Earthquake* while the event *Radio broadcast* can only be triggered by *Earthquake*

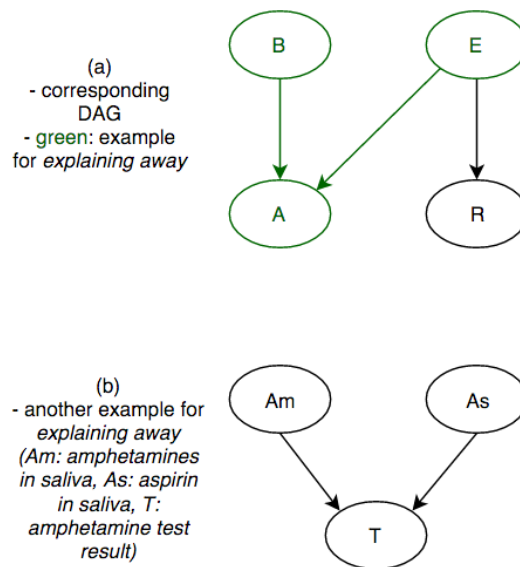


Figure 1: DAG realisation of given random variables

- b)
 - explaining away means that two statistically independent random variables can become statistically dependent by observing a common child
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