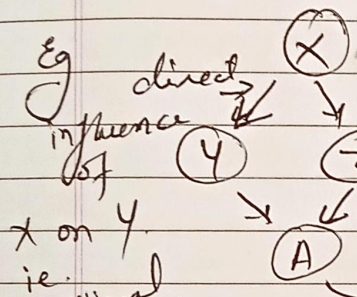
Bayesian Belief Nlw in AI

- Bayesian Belief Nlw in AI:
  It defines probabilistic independencies & dependencies among the variables in the Nlw.

- It is a probabilistic graphical model which represents a set of variables and their conditional dependencies using a "directed acyclic graph (DAG)".

- Represented with ① Nodes → Random variable → Discrete / continuous
  ② Arc / Directed arrows — represents Conditional probabilities or casual relationships betn. random variables

- Consists of:
  ① DAG
  ② Table of Conditional probabilities (CPT)

Eg 

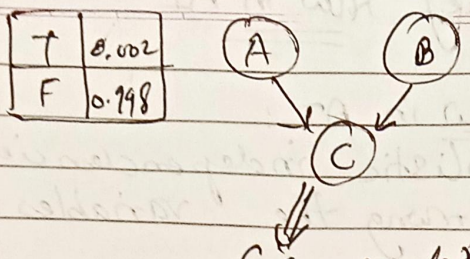
ie. Conditional probability

→ table is created for Conditional prob. of all nodes with effect of parent nodes

⇒ To propagate belief in Bayesian Nlw, "DAG" is converted to an undirected graph in which the arcs can be used to transmit probabilities in direction of evidence.

Event will be true or false

T	0.002
F	0.998

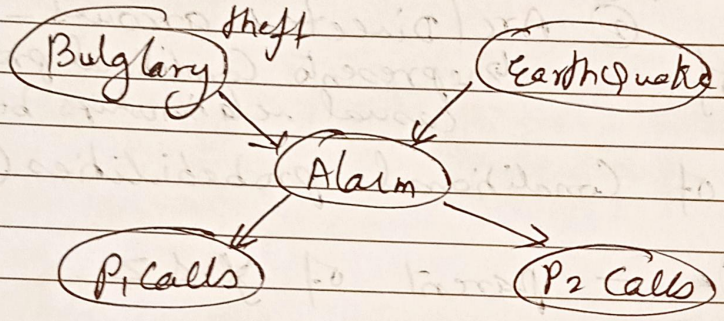


T	0.001
F	0.999

C's conditional probability is,

A	B	P(C=T)	P(C=F)
T	T		
T	F		
F	T		
F	F		

Eg



Given probabilities are,

$$\begin{cases} P(B=T) = 0.001 \\ P(B=F) = 0.999 \end{cases}$$

$$\begin{cases} P(E=T) = 0.002 \\ P(E=F) = 0.998 \end{cases}$$

→ probability of Alarm (w.r.t. parent.

Burglary (B)	Earthquake (E)	P(A=T)	P(A=F)
T	T	0.95	0.05
T	F	0.99	0.06
F	T	0.29	0.71
F	F	0.001	0.999

→ probability of P_1 :

→ one parent (Alarm)

Alarm (A)	$P(P_1 = T)$	$P(P_1 = F)$
T	0.90	0.10
F	0.05	0.95

→ probability of P_2 :

A	$P(P_2 = T)$	$P(P_2 = F)$
T	0.70	0.30
F	0.01	0.99

Q: find the probability of P_1 is T, P_2 is T, A is T, B is F & E is F.

(Follow Bayes Thm for

ie $P(P_1, P_2, A, \neg B, \neg E)$

$= P(P_1/A)\,(P_2/A)\,P(A/\neg B, \neg E) \cdot P(\neg B) \cdot P(\neg E)$

$= 0.90 \times 0.70 \times 0.001 \times 0.999 \times 0.998$

$= 0.00062$

(probability is less. as No $\neg E$ & $\neg$No B ∴ Alarm probability is less & so for P_1 & P_2 calling.

Bayes Thm :

$$P(B/A) = \frac{P(A/B) \cdot P(B)}{P(A)}$$