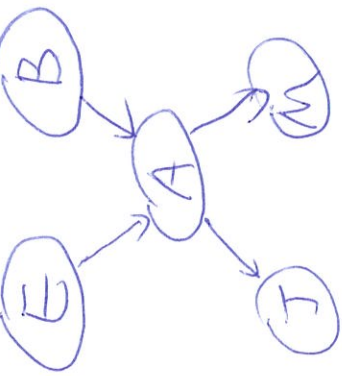




cause effect
 $E \rightarrow A$

$B \rightarrow A$
 $A \rightarrow J$
 $A \rightarrow M$



$$P(B) = P(B|E)$$

$$P(A) = P(A|B, E)$$

$$P(A|E) = P(A|B, E)$$

$$P(J) = P(J|A, B, E) \quad \neq 10\%$$

$$P(J|A) = P(J|A, B, E)$$

$$P(J|B) = P(J|A, B, E)$$

$$P(J|E) = P(J|A, B, E)$$

$$P(a|e) = P(a|e, b) \quad \neq 80\%$$



$$P(F|P) = \frac{P(f|P)}{P(\neg f|P)}$$

$$P(f|P) = P(f, P) \propto$$

$$P(f, P) = P(f, h, P) + P(f, \neg h, P)$$

$$P(f, h, P) = P(f) \times \boxed{P(h|f) \times P(P|h)}$$

$$P(f, \neg h, P) = P(f) \times P(\neg h|f) \times P(P|\neg h)$$

$$(m+n) \times 2^{m+1}$$

$$P(B|j, m)$$

J	m	
j	m	0.6
j	$\neg m$	0.1
$\neg j$	m	
$\neg j$	$\neg m$	

$$P(B|j,m) < \frac{P(b|j,m)}{P(\neg b|j,m)}$$

$$P(b|j,m) = \alpha \times P(b, j, m)$$

$$P(\neg b|j,m) = \alpha \times P(\neg b, j, m)$$

$$\alpha = \frac{1}{P(b, j, m) + P(\neg b, j, m)}$$

$$P(b, j, m) = \frac{P(e, b, a, j, m) + P(e, b, \neg a, j, m) + P(\neg e, b, a, j, m) + P(\neg e, b, \neg a, j, m)}{1}$$

$$= \frac{P(e)P(b)P(a|e,b)P(j|a)P(m|a) + P(e)P(b)P(\neg a|e,b)P(j|\neg a)P(m|\neg a) + \dots}{1}$$

$$P(B|a) < \frac{P(b|a)}{P(\neg b|a)}$$

① convert to joint prob.

~~$P(B|a)$~~

$$P(b|a) = P(b, a) \times \frac{1}{P(a)} \quad \alpha = \frac{1}{P(a)}$$

$$P(\neg b|a) = P(\neg b, a) \times \frac{1}{P(a)} \quad \alpha$$

$$P(b|a) + P(\neg b|a) = 1$$

$$P(b, a) \times \alpha + P(\neg b, a) \times \alpha = 1$$

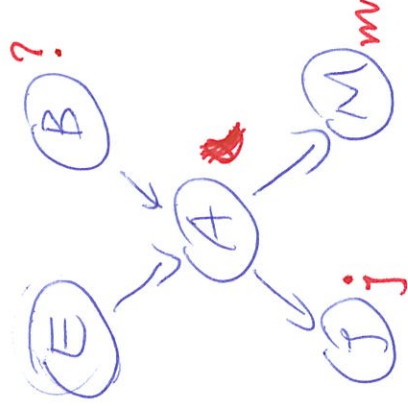
$$\alpha = \frac{1}{P(b, a) + P(\neg b, a)}$$

only need to calculate $P(b, a)$ and $P(\neg b, a)$

$$P(b, a) = P(e, b, a) + P(\neg e, b, a)$$

$$= \frac{P(e) \times P(b) \times P(a|e, b) + P(\neg e) \times P(b) \times P(a|\neg e, b)}{}$$

read the tables



$$P(X_1, X_2, \dots, X_n) = \frac{P(X_1 | \text{parents}(X_1)) \times \dots}{P(X_n | \text{parents}(X_n))}$$

$$P(B, j, m) = \sum_{E, A} P(E) P(B) P(A|E, B) P(j|A) P(m|A)$$

$$f_1(E) f_2(B) f_3(A, E, B) f_4(A) f_5(A)$$

$$f_6(A, B, E) \times f_2(B) \times f_4(A) \times f_5(A)$$

$$f_1(E) = P(E)$$

E	f ₁ (E)
e	P(e)
¬e	P(¬e)

B	f ₂
b	P(b)
¬b	P(¬b)

A	f ₄
a	P(j a)
¬a	P(j ¬a)

$$f_4 \text{ join } f_5 = f_6$$

A	f ₆
a	P(j a) × P(m a)
¬a	P(j ¬a) × P(m ¬a)

$$f_2(B)$$

A	E	B	f ₃
a	e	b	P(A E, B)
a	e	¬b	
a	¬e	b	
¬a	¬e	¬b	

A	f ₅
a	P(m a)
¬a	P(m ¬a)

$$f_1(E) f_2(B) f_7(A, E, B)$$

$$\Rightarrow \sum_{E, A} f_1(E) f_2(B) f_3(A, E, B) f_6(A)$$

$$f_3 \text{ join } f_6 \Rightarrow f_7(A, E, B)$$

A	E	B	f ₇
a	e	b	P(a e, b) × P(j a) P(m a)
a	e	¬b	
⋮	⋮	⋮	