Many Pieces of Evidence

Priors

P(Flu)	= 1/40	P(Not Flu)	= 39/40
P(Headache | Flu)	= 1/2	P(Headache | not Flu)	= 7 / 78
P(Cough | Flu)	= 2/3	P(Cough | not Flu)	= 1/6
P(Sore | Flu)	= 3/4	P(Sore | not Flu)	= 1/3

Conditionals

Pat walks in to the surgery.

Pat is sore and has a headache but no cough

What is P(F | H and not C and S) ?

$$P(F \mid H \text{ and not } C \text{ and } S)$$

$$= \frac{P(H \text{ and not } C \text{ and } S \text{ and } F)}{P(H \text{ and not } C \text{ and } S)}$$

$$= \frac{P(H \text{ and not } C \text{ and } S \text{ and } F)}{P(H \text{ and not } C \text{ and } S \text{ and } F) + P(H \text{ and not } C \text{ and } S \text{ and not } F)}$$

P(A and B and C) = P(A and B and C and D) + P(A and B and C and not D)

主要记住P(A and B) = P(A | B) × P(B)

P(A and B and C) = P(A | B and C) × P(B and C)

P(A and B) = P(A and B and C) + P(A and B and not C)

关于H、C、S都是条件独立的

$$= P(H \mid \text{not } C \text{ and } S \text{ and } F) \times P(\text{not } C \text{ and } S \text{ and } F)$$

$$= P(H \mid F) \times P(\text{not } C \text{ and } S \text{ and } F)$$

$$= P(H \mid F) \times P(\text{not } C \mid S \text{ and } F) \times P(S \text{ and } F)$$

$$= P(H \mid F) \times P(\text{not } C \mid F) \times P(S \text{ and } F)$$

$$= P(H \mid F) \times P(\text{not } C \mid F) \times P(S \mid F) \times P(F)$$

中间化简过程P(not C | S and F) = P (not C | F)因为S与C是条件独立的，并不会影响到彼此，故这里直接去掉了