• Inference using Full Joint Distribution

Bayesian network is based on Joint probability distribution and conditional probability.

If we have variables x1, x2, x3,....., xn, then the probabilities of a different combination of x1, x2, x3.. xn, are known as Joint probability distribution.

P[x1, x2, x3,....., xn], it can be written as the following way in terms of the joint probability distribution.

= P[x1| x2, x3,....., xn]P[x2, x3,....., xn]

$$P(X_i | X_{i-1}, \ldots\ldots\ldots, X_1) = P(X_i \ | Parents(X_i\ ))$$

Example:

(b) Find the probabilistic inference by enumeration of entries in a full joint distribution table shown in figure 1. **10**

(i) No cavity when toothache is there

(ii) p (Cavity! toothache or catch)

	toothache		¬toothache	
	catch	¬catch	catch	¬catch
cavity	.108	.012	.072	.008
¬cavity	.016	.064	.144	.576

Solution

1. No cavity when toothache is there

$$P(\neg cavity|toothache) = P(\neg cavity^t oothache)/P(toothache)$$
$$= (0.016 + 0.064)/(0.108 + 0.012 + 0.016 + 0.064)$$
$$= 0.4$$

2. p(Cavity|toothache or catch)

$$= P(Cavity|toothache) + p(catch)$$
$$= [P(cavity\hat{t}oothache)/P(toothache)] + P(catch)$$
$$= [(0.108 + 0.012)]$$
$$/[(0.108 + 0.012 + 0.016 + 0.064 + (0.108 + 0.016 + 0.072 + 0.144)$$
$$= 0.96$$