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Sec: A

CT-4

Answer to the question no: 1

Yes I agree with the given statement.

Suppose, there are four states

$$X_1 \rightarrow X_2 \rightarrow X_3 \rightarrow X_4$$

From the chain rule, every joint distribution over X_1, X_2, X_3, X_4 can be written as-

$$P(X_1, X_2, X_3, X_4) = P(X_1) P(X_2|X_1) P(X_3|X_1, X_2) P(X_4|X_1, X_2, X_3)$$

Assuming that,

$$X_3 \perp\!\!\!\perp X_1 | X_2 \quad \text{and} \quad X_4 \perp\!\!\!\perp X_1, X_2 | X_3$$

which will result in the Markov Model theory-

$$P(X_1, X_2, X_3, X_4) = P(X_1) P(X_2|X_1) P(X_3|X_2) P(X_4|X_3)$$

In Markov Model, it is assumed that the future states depend only on the current state, not on the events that occurred before it.

Answer to the question no: 2

My birthdate is 23.

$B = 23 \% 1000 = 0.023$

$C = \sqrt{23} \% 1000 = 0.005$

$A = 1 - B = 1 - 0.023 = 0.977$

$D = 1 - C = 1 - 0.005 = 0.995$

The values of the probabilities are as follows -

Sunday	Next day	Probability
rain	rain	0.977
rain	not rain	0.023
not rain	rain	0.005
not rain	not rain	0.995

Given, The probability of raining on sunday is 0.5.

So, the probability of not rain on sunday will be $1 - 0.5$ [As we know, P(rain) + P(not rain) = 1]
$= 0.5$

Let's consider,

X_1 = sunday

X_2 = monday

$$P(X_2=\text{rain}) = P(X_2=\text{rain} \mid X_1=\text{not rain})\, P(X_1=\text{not rain})$$
$$+ P(X_2=\text{rain} \mid X_1=\text{rain}) \cdot P(X_1=\text{rain})$$

$$= 0.005 * 0.5 + 0.977 * 0.5$$

$$= 0.0025 + 0.4885$$

$$= 0.491$$

So, the probability of raining on monday will be 0.491.