

Week 9 Lab Agenda

Part A

Question 1, 2 & 3 (Questions similar to **Lab-8**)

Part B :

Question 4 & 5

Joint Probability Notation

- $P(A \cap B)$ can also be expressed as $P(A, B)$

A = Rain
B = Sky is dark

- Probability of Event A & B happened at the same time.
- Probability that It Rain (AND) Sky is Dark

Conditional Probability Notation

- $P(A | B)$ Event B already happened/given

A = Rain
B = Sky is dark

Have

- Can be expressed as:
 1. The probability that event A happens given that event B has already occurred
 2. The probability that It Rain given that the Sky is Dark

1) How to calculate Joint Probability

1) Determine the joint probability of P(A, B)

$$\begin{aligned}P(A, B) &= P(B | A) * P(A) \\ &= 0.50 * 0.20 \\ &= 0.10\end{aligned}$$

Given (Random value):

- P(A) = 0.20
- P(B|A) = 0.50

$$\begin{aligned}P(A, B) &= P(A) * P(B | A) \\ &= 0.20 * 0.50 \\ &= 0.10\end{aligned}$$

1) Joint Probability, Bayesian network (Continue..)

$$P(A, B, C, D) = \left[P(A) * P(B | A) \right] * P(C | B) * P(D | B)$$

2) How to calculate Probability of an event (Marginal Probability)

1) Calculate $P(B)$

$$\begin{aligned} P(B) &= P(A, B) + P(A', B) \\ &= 0.10 + 0.30 \\ &= 0.40 \end{aligned}$$

Given Joint Probability (Example with Random value):

- $P(A, B) = 0.10$
- $P(A, B') = 0.20$
- $P(A', B) = 0.30$
- $P(A', B') = 0.30$

3) How to calculate Posterior Probability

1) Find posterior probability of $P(A | B)$

$$\begin{aligned} P(A | B) &= \frac{P(A, B)}{P(B)} \\ &= \frac{0.20}{0.50} \\ &= 0.4 \end{aligned}$$

Given Information (Example with Random value):

- $P(B) = 0.50$
- $P(A, B) = 0.20$