Conjunction in Propositional Logic (AI Examples)

1. Definition

Conjunction (AND) is represented as $P \wedge Q$.
It is true only if both P and Q are true, otherwise false.

2. Truth Table of Conjunction ($P \wedge Q$)

P	Q	$P \wedge Q$
T	T	T
T	F	F
F	T	F
F	F	F

Example 1: Medical Diagnosis

Propositions:
- F: 'Patient has fever'
- C: 'Patient has cough'
- D: 'Patient has dengue'

Rule: $(F \wedge C) \rightarrow D$
Facts: F = True, C = True
Inference: Since $F \wedge C = T$, dengue (D) is inferred true.

Example 2: Smart Home Automation

Propositions:
- M: 'Motion is detected'
- N: 'It is night'
- L: 'Lights should turn on'

Rule: $(M \wedge N) \rightarrow L$
Facts: M = True, N = True
Inference: Since $M \wedge N = T$, lights turn on (L = True).

Example 3: Traffic Safety

Propositions:
- R: 'It is raining'
- H: 'Road is hilly'
- A: 'Accident risk is high'

Rule: (R ∧ H) → A
Facts: R = True, H = True
Inference: Since R ∧ H = T, accident risk (A) is True.

Example 4: Game Playing (Chess AI)

Propositions:
- K: 'Opponent's king is in check'
- N: 'Opponent has no legal moves'
- W: 'AI wins the game'

Rule: (K ∧ N) → W
Facts: K = True, N = True
Inference: Since K ∧ N = T, AI wins the game (W = True).

Example 5: Wumpus World

Propositions:
- B: 'There is a breeze'
- A: 'There is an arrow'
- S: 'Agent shoots'

Rule: (B ∧ A) → S
Facts: B = True, A = True
Inference: Since B ∧ A = T, agent shoots (S = True).