

Artificial Intelligence

Exercise 1

1. Represent the following English sentences using a semantic network:
Tweety is a white-colored canary. Canary is a singing bird. A bird is a feathered flying animal.
2. Represent the following English sentences using a semantic network:
An equilateral triangle is a triangle whose sides are equal. A triangle is a closed shape that has three sides and three angles.
3. Using truth tables, prove that:
 - a) $\neg(\neg P) \equiv P$
 - b) $(P \vee Q) \equiv (\neg P \rightarrow Q)$
 - c) $(P \rightarrow Q) \equiv (\neg Q \rightarrow \neg P)$
 - d) (i) $\neg(P \vee Q) \equiv (\neg P \wedge \neg Q)$, (ii) $\neg(P \wedge Q) \equiv (\neg P \vee \neg Q)$
 - e) (i) $(P \vee Q) \equiv (Q \vee P)$, (ii) $(P \wedge Q) \equiv (Q \wedge P)$
 - f) $(P \wedge Q) \wedge R \equiv P \wedge (Q \wedge R)$
 - g) $(P \vee Q) \vee R \equiv P \vee (Q \vee R)$
 - h) $P \vee (Q \wedge R) \equiv (P \vee Q) \wedge (P \vee R)$
 - i) $P \wedge (Q \vee R) \equiv (P \wedge Q) \vee (P \wedge R)$
4. Using truth tables, prove that:
 - (i) $(p \wedge (p \rightarrow q)) \rightarrow q$
 - (ii) $((P \rightarrow Q) \wedge \neg Q) \rightarrow \neg P$
 - (iii) $(P \rightarrow (Q \rightarrow R)) \rightarrow ((P \rightarrow Q) \rightarrow (P \rightarrow R))$
5. The logical operator " \leftrightarrow " is read "if and only if." $P \leftrightarrow Q$ is defined as being equivalent to $(P \rightarrow Q) \wedge (Q \rightarrow P)$. Based on this definition, show that $P \leftrightarrow Q$ is logically equivalent to $(P \vee Q) \rightarrow (P \wedge Q)$ by using truth tables.