Unification in Artificial Intelligence

Key points

1) Unification is a process of making two different logical atomic expressions identical by finding a substitution. Unification depends on the substitution process.

2) It takes two literals as inputs and make them identical using substitution.

3) The UNIFY algorithm is used for unification, which takes two atomic sentences and returns a unifier for those sentences (if any exist)

4) Unification fails if the expressions do not match with each other.

5) The substitution variables are called Most General Unifier or MGU.

Conditions for Unification

1) Predicate symbol must be same, atom or expression with different predicate symbol can never be unified.

2) Number of arguments in both expressions must be identical.

3) Unification will fail if there are two similar variables present in the same expression.

Questions

1) Find the MGU of UNIFY (prime(11), prime(y))

→ Here, Ψ1 = prime(11) and Ψ2 = prime(y)

So, ⇒ { prime(11), prime(y) }

SUBST θ = { 11/y }

S1 ⇒ { prime(11), prime(11) },

Successfully unified.

unifier = {11/y}

2) UNIFY (knows (Richard, x), knows (Richard, John))

Here, Ψ1 = knows (Richard, x) and Ψ2 = knows (Richard, John)

So ⇒ { knows (Richard, x), knows (Richard, John) }

SUBST θ = { John/x }

S1 ⇒ { knows (Richard, John), knows (Richard, John) }

successfully unified, unifier = {John/x}

3) Find the MGU of $\{Q(a, g(x,a), f(y)), Q(a, g(f(b),a), x)\}$

⇒ Here, $\Psi 1 = \{Q(a, g(x,a), f(y))\}$ and

$\Psi 2 = \{Q(a, g(f(b), a), x)\}$

So ⇒ $\{Q(a, g(x,a), f(y)), Q(a, g(f(b),a), x)\}$

SUBST $\theta = \{f(b)/x\}$

S1 ⇒ $\{Q(a, g(f(b),a), f(y)), Q(a, g(f(b),a), f(b))\}$

SUBST $\theta = \{b/y\}$

S2 ⇒ $\{Q(a, g(f(b),a), f(b)), Q(a, g(f(b),a), f(b))\}$

Successfully unified.