

## COMP2411 Lecture 18: Computing the Most General Unifier – Examples

**Example 1:**

$$S = \left\{ \begin{array}{l} q(f(X), X), \\ q(f(h(T)), g(U)) \end{array} \right\}$$

$$\theta_0 = \epsilon \quad S\theta_0 = S \quad D_0 = \{X, h(T)\}$$

$$\theta_1 = \theta_0 \circ [X \mapsto h(T)] = [X \mapsto h(T)]$$

$$S\theta_1 = \left\{ \begin{array}{l} q(f(h(T)), h(T)), \\ q(f(h(T)), g(U)) \end{array} \right\}$$

$$D_1 = \{h(T), g(U)\}$$

$D_1$  does not contain a variable, so we halt and report non-unifiability.

**Example 2:**

$$S = \left\{ \begin{array}{l} p(X, f(X)), \\ p(Y, Y) \end{array} \right\}$$

$$\theta_0 = \epsilon \quad D_0 = \{X, Y\}$$

$$\theta_1 = [X \mapsto Y]$$

$$S\theta_1 = \left\{ \begin{array}{l} p(Y, f(Y)), \\ p(Y, Y) \end{array} \right\}$$

$$D_1 = \{f(Y), Y\}$$

$D_1$  contains a variable  $Y$ , but this occurs in  $f(Y)$ , so we halt and report non-unifiability.

**Example 3:**

$$S = \left\{ \begin{array}{l} q(X, f(X), g(a)), \\ q(V, f(g(T)), V) \end{array} \right\}$$

$$\theta_0 = \epsilon \quad D_0 = \{X, V\}$$

$$\theta_1 = [X \mapsto V]$$

$$S\theta_1 = \left\{ \begin{array}{l} q(V, f(V), g(a)), \\ q(V, f(g(T)), V) \end{array} \right\}$$

$$D_1 = \{V, g(T)\}$$

$$\begin{aligned}\theta_2 &= \theta_1 \circ [V \mapsto g(T)] \\ &= [X \mapsto V] \circ [V \mapsto g(T)] \\ &= [X \mapsto g(T), V \mapsto g(T)]\end{aligned}$$

$$S\theta_2 = \left\{ \begin{array}{l} q(g(T), f(g(T)), g(a)), \\ q(g(T), f(g(T)), g(T)) \end{array} \right\}$$

$$D_2 = \{a, T\}$$

$$\begin{aligned}\theta_3 &= \theta_2 \circ [T \mapsto a] \\ &= [X \mapsto g(T), V \mapsto g(T)] \circ [T \mapsto a] \\ &= [X \mapsto g(a), V \mapsto g(a), T \mapsto a]\end{aligned}$$

$$\begin{aligned}S\theta_2 &= \left\{ \begin{array}{l} q(g(a), f(g(a)), g(a)), \\ q(g(a), f(g(a)), g(a)) \end{array} \right\} \\ &= \{q(g(a), f(g(a)), g(a))\}\end{aligned}$$

which is a singleton, so we halt and output the most general unifier  $[X \mapsto g(a), V \mapsto g(a), T \mapsto a]$