

Logic for AI — Master 1 IFI  
Class Assignment #4: Unification and Resolution

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## 1 Unification

Determine the most general unifier for the following sets of sentences, if they are unifiable; otherwise, explain why they cannot be unified:

1.  $\{P(a, x, f(g(y))), P(z, f(z), f(u))\}$ ;
2.  $\{Q(f(a), g(x)), Q(y, y)\}$ ;
3.  $\{P(f(x, y), g(z, z)), P(f(f(w, z), v), w)\}$ ;
4.  $\{P(x, x), P(f(y), y)\}$ .

## 2 Resolution

Prove the following theorems using resolution:

1. Hypotheses:

- $\exists x(P(x) \wedge \forall y(D(y) \Rightarrow L(x, y)))$ ,
- $\forall x(P(x) \Rightarrow \forall y(Q(y) \Rightarrow \neg L(x, y)))$ .

Thesis:  $\forall x(D(x) \Rightarrow \neg Q(x))$ .

2. Hypotheses:

- $\forall x(E(x) \wedge \neg V(x) \Rightarrow \exists y(S(x, y) \wedge C(y)))$ ,
- $\exists x(P(x) \wedge E(x) \wedge \forall y(S(x, y) \Rightarrow P(y)))$ .

Thesis:  $\forall x(P(x) \Rightarrow \neg V(x))$ .