

Artificial Intelligence

First Order Logic (part 3)

CS 444 – Spring 2019

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Resolution – Removing UIs

We need to convert our sentences to CNF (just like propositional logic).

How do we deal with **universal instantiation**:

$$\forall x \text{ American}(x) \wedge \text{Weapon}(y) \wedge \text{Sell}(x, y, z) \wedge \text{Hostile}(z) \implies \text{Criminal}(x)$$

Since we know how to do unification with variables, we can simply drop the UI terms.

$$\text{American}(x) \wedge \text{Weapon}(y) \wedge \text{Sell}(x, y, z) \wedge \text{Hostile}(z) \implies \text{Criminal}(x)$$

And then use Unification to put in constants from the KB.

$$\{x/\text{West}\}$$

$$\text{American}(\text{West}) \wedge \text{Weapon}(y) \wedge \text{Sell}(\text{West}, y, z) \wedge \text{Hostile}(z) \implies \text{Criminal}(\text{West})$$

Resolution – Removing Existential Instantiation

We need to convert our sentences to CNF (just like propositional logic).

How do we deal with **universal instantiation**:

$\exists x \text{Crown}(x) \wedge \text{OnHead}(x, \text{John})$

We know that some object exists that is the crown that is on John's head.

Thus, we can create a new constant, k , as long as k does not appear anywhere else in the knowledge base. Thus, we can get:

$\text{Crown}(C_1) \wedge \text{OnHead}(C_1, \text{John})$

This process is called **Skolemization** (and the C_1 is a **skolem** constant).

Example: Nono .. Has some missiles

$\exists x \text{Owns}(\text{Nono}, x) \wedge \text{Missile}(x)$:

$\text{Owns}(\text{Nono}, M_1)$ and $\text{Missile}(M_1)$

Example of Resolution

