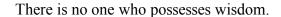
CS1571 Fall 2019 10/14 In-Class Worksheet

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Where were you sitting in class today: Back Right

A. Pre-Reflection
On a scale of 1-5, with 5 being most confident, how well do you think you could execute these learning objectives:
11.2 Translate English sentences into first order logic 12.1 Demonstrate how to make inferences in FOL using resolution 12.2 Explain what a definite clause is and why it is useful.
B. Translate English sentences into FOL1. Translate the following sentences into FOL:
Every major scale has a relative minor scale
$\forall x (major(x)) \rightarrow \exists y (minor(y))^Relative(x, y)$
There is something that someone is an expert in.
X= person
Y=areas of expertise
∃x,yPerson(x) ^ Area(y) ^ Expert(x, y)
Someone at Pitt has learned four languages.
∃x atPitt(x) ^ Knows(four languages)



~∃x Person(x) ^ Wisdom(x)

C. Demonstrate how to make inferences in FOL using resolution:

2. Convert the following expression to conjunctive normal form: Everyone who loves all animals is loved by somebody. $\forall x (\forall y \text{Animal}(y) \Rightarrow \text{Loves}(x,y)) \Rightarrow (\exists y \text{Loves}(y,x))$

Step 1: Remove the biconditionals and implications.

$$(\forall x \sim (\forall y \sim Animal(y) \lor Loves(x,y))) \lor (\exists y Loves(y,x)))$$

Step 2: Move the negations inward.

$$\forall x (\exists y Animal(y) \land \sim Loves(x, y)) \lor (\exists y Loves(y,x))$$

Step 3: Standardize variables

$$\forall x (\exists y \text{ Animal}(y) \land \sim \text{Loves}(x, y)) \text{ V } (\exists z \text{Loves}(z, x))$$

Step 4: Skolemize

$$\forall x (Animal(F(x)) \land \sim Loves(x, F(x))) \ V \ (Loves(G(x), x)$$

Step 5: Drop universal quantifiers

$$(Animal(F(x)) ^ \sim Loves(x, F(x))) V (Loves(G(x), x))$$

$(Animal(F(x)) \ V \ (Loves(G(x), x)) \ ^ \sim Loves(x, F(x))) \ V \ (Loves(G(x), x))$

D. Prove Curiosity Killed the Cat Using Resolution
KB:
Animal($F(x)$) v Loves($G(x)$, x)
\sim Loves(x, F(x)) v Loves(G(x), x)
\sim Loves(y,x) v \sim Animal(z) v \sim Kills(x,z)
~Animal(x) v Loves(Jack, x)
Kills(Jack, Tuna) v Kills(Curiosity, Tuna)
Cat(Tuna)
~Cat(x) v Animal(x)
~Kills(Curiosity, Tuna) (this is your negative alpha)

E. Explore Code

 $Download\ logic.py\ from\ \underline{https://github.com/aimacode/aima-python}$

Find substitution, unification, and resolution functions. Explain how they work.				

Post-Reflection

On a scale of 1-5, with 5 being most	confident, how	y well do you t	think you could	execute
these learning objectives:				

11.2 Translate English sentences into first order logic	
12.3 Demonstrate how to make inferences in FOL using resolution	
12.4 Explain what a definite clause is and why it is useful.	