# Semantic Web Lab 3:
# Tableaux Proving and using the NLTK in Python

1. Consider the following knowledge base:

$$VEGAN \equiv \forall EATS.PLANT$$
$$VEGETARIAN \equiv \forall EATS.(PLANT \sqcup DAIRY)$$

Is the query $VEGAN \sqsubseteq VEGETARIAN$ entailed by the knowledge base? Construct a Tableau using the tableaux inference rules for DL logic in the lecture slides, using the termination conditions for each branch appropriately to look for clashes.

2. Consider the following 2 premises $p1$ and $p2$ and conclusion $c$:

$$
\begin{array}{rl}
p1 & man(Socrates) \\
p2 & man \sqsubseteq mortal \\
c & mortal(Socrates)
\end{array}
$$

Open an interactive Python shell and run the example on the Natural Language ToolKit (NLTK) theorem provers for proving the consequent $c$ from the premises $p1$ and $p2$ below, as described at `http://nltk.googlecode.com/svn/trunk/doc/howto/inference.html`.

Make sure you set the `verbose=True` parameter for the `TableauProver()` so you can see how the proof works. To use the provers you'll have to translate the Description Logic in the above back into Predicate Calculus (FOL).

3. Now try to recreate the proofs in question (1) using the NLTK provers. The trick here is to appropriately translate the DL into FOL. If the prover terminates as it should, can you follow the proof constructed?

4. Consider the following ontology:

$$A \equiv \forall R.B$$
$$C \equiv \forall R.D$$
$$B \sqsubseteq D$$

Give a subsumption which can be inferred (i.e. in the inferred hierarchy) but not in the asserted hierarchy. Show, using a tableau proof, that this subsumption holds. Or run the appropriate script!