ilp-exercises

March 26, 2019

1 19. Knowledge in Learning

19.1 [dbsig-exercise]Show, by translating into conjunctive normal form and applying resolution, that the conclusion drawn on page Section **??** concerning Brazilians is sound.

19.2 For each of the following determinations, write down the logical representation and explain why the determination is true (if it is):

1. Design and denomination determine the mass of a coin.
2. For a given program, input determines output.
3. Climate, food intake, exercise, and metabolism determine weight gain and loss.
4. Baldness is determined by the baldness (or lack thereof) of one's maternal grandfather.

19.3 For each of the following determinations, write down the logical representation and explain why the determination is true (if it is):

1. Zip code determines the state (U.S.).
2. Design and denomination determine the mass of a coin.
3. Climate, food intake, exercise, and metabolism determine weight gain and loss.
4. Baldness is determined by the baldness (or lack thereof) of one's maternal grandfather.

19.4 Would a probabilistic version of determinations be useful? Suggest a definition.

19.5 [ir-step-exercise]Fill in the missing values for the clauses C_1 or C_2 (or both) in the following sets of clauses, given that C is the resolvent of C_1 and C_2:

1. $C = True \;\Rightarrow\; P(A,B), C_1 = P(x,y) \;\Rightarrow\; Q(x,y), C_2 =??.$
2. $C = True \;\Rightarrow\; P(A,B), C_1 =??, C_2 =??.$
3. $C = P(x,y) \;\Rightarrow\; P(x,f(y)), C_1 =??, C_2 =??.$

If there is more than one possible solution, provide one example of each different kind.

19.6 [prolog-ir-exercise]Suppose one writes a logic program that carries out a resolution inference step. That is, let $Resolve(c_1,c_2,c)$ succeed if c is the result of resolving c_1 and c_2. Normally, $Resolve$ would be used as part of a theorem prover by calling it with c_1 and c_2 instantiated to particular clauses, thereby generating the resolvent c. Now suppose instead that we call it with c

instantiated and c_1 and c_2 uninstantiated. Will this succeed in generating the appropriate results of an inverse resolution step? Would you need any special modifications to the logic programming system for this to work?

19.7 [foil-literals-exercise]Suppose that is considering adding a literal to a clause using a binary predicate P and that previous literals (including the head of the clause) contain five different variables.

1. How many functionally different literals can be generated? Two literals are functionally identical if they differ only in the names of the *new* variables that they contain.

2. Can you find a general formula for the number of different literals with a predicate of arity r when there are n variables previously used?

3. Why does not allow literals that contain no previously used variables?

19.8 Using the data from the family tree in Figure Section **??**, or a subset thereof, apply the algorithm to learn a definition for the *Ancestor* predicate.