EEL5840: Elements of Machine Intelligence

Announcements

- Reading Assignment:
  > None
- Announcements:
  > Second Exam Review
- Today’s Handouts:
  > None
- Web Site
  > www.mil.ufl.edu/eel5840
  > Software and Notes

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Today’s Menu

- Exam #2 Overview
Conversion to Clause Form

I. Given a wff \( A \) convert it into CNF (\textit{clause form}) matrix form.
For each of the 10 “\textit{official steps}” required give a brief description of the step and perform the step or write N/A \{not applicable\} on the space provided.

- Step 0. remove redundant quantifiers and take the Existential Closure
- Step 1. Eliminate Implications \((w_1 \rightarrow w_2 \Leftrightarrow \neg w_1 \vee w_2)\)
- Step 2. Move Negations down to the Atfs \(\neg \forall xP(x) \Leftrightarrow \exists x[\neg P(x)]\)
- Step 3. Standardize Variables Apart
- Step 4. Skolemize \{Purge \(\exists v_i\)\}
- Step 5. Move all \(\forall\) to the left
- Step 6. Distribute - move disjunctions down to the literals
- Step 7. Rewrite in Matrix Form
- Step 8. Standardize Variables Apart
- Step 9. Purge \(\forall\) \{Assume all variables are universally quantified\}
- Step 10. Simplify! (Eliminate Tautologies)

II. Resolution Refutation

Given a word problem.
Solve by drawing a Refutation Graph resulting from your choice of strategy.
(Make sure you mark clearly the required substitutions).

[Required: Please note the assigned point values. Each part MUST be answered with something. If left blank, then no credit will be assigned]
a. Represent the axioms/goal in the Predicate Calculus.
b. Represent any commonsense knowledge needed to solve the problem using Predicate Calculus,
c. Convert your axioms, goal and commonsense knowledge (if any) to clause form
d. Draw a Refutation Graph
e. Consistency Check
III. Computation Deduction.

Given a set of Facts and Rules and a Goal \( wff \)

Required: Give the entire resolution trace using a complete strategy (tell me your strategy), show the substitutions are consistent, & obtain the value of the goal.

IV. Adversarial Search {Example}

Consider the following game tree in which the static scores (in parentheses at the tip nodes) are all from the first player’s point of view.

(a) Assuming that the first player is the maximizing player, what move should the first player choose?

(b) Assuming that the first player is the minimizing player, what move should the first player choose?

(c) What nodes would not need to be examined in part (a) using the alpha-beta algorithm - assuming that the nodes are examined in left-to-right order?

(d) What nodes would not need to be examined in part (b) using the alpha-beta algorithm - assuming that the nodes are examined in right-to-left order?

(e) Is the first player’s move in parts (a) and (c) or in parts (b) and (d) different? Explain.
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**Heuristic Searches**

V. The following figure shows a search tree with the state indicated by the tuple inside parentheses. A letter indicates the state name and the integer indicates the estimated cost for finding a solution from that state (a cost of 0 indicates a goal state). Using the Graph-Search algorithm discussed in class, give the solution tree or steps using depth-first search. How many nodes did depth-first expand? Repeat using breadth-first search. How many nodes did breadth-first expand? Repeat using heuristic search. How many nodes did heuristic search expand? Repeat using A* search. How many nodes did A* expand? Can any of these algorithms ever find N as a solution? Explain

The End!