

CMPT 411/721 - Knowledge Representation and Reasoning

Assignment 1

Due date: Sept 27, 2019

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Sept. 13, 2019

Important Note: Students must work individually on this, and other CMPT 411/721, assignments. You may not discuss the specific questions in this assignment, nor their solutions with any other student. You may not provide or use any solution, in whole or in part, to or by another student.

You are encouraged to discuss the general concepts involved in the questions in the context of completely different problems. If you are in doubt as to what constitutes acceptable discussion, please ask!

1. [2 marks] (Propositional Logic)
 - (a) The following information concerns a party last weekend:
If John went to the party, then Mary went
If Mary went, then it was a good party
Express this information in propositional logic; as well, use propositional logic for the following parts.
 - i. You also learn that it was a good party. Can you conclude that John went to the party? Prove or disprove this proposition
 - ii. You learn instead that it wasn't a good party. Can you conclude that John didn't go? Again, prove or disprove.
 - (b) Consider the formulas: $a \vee b$, $a \supset c$, $b \supset d$. If we consider just the atoms appearing in the formulas:
 - i. How many interpretations are there?
 - ii. How many models of the formulas are there?
 - iii. Prove using truth tables or arguing via interpretations that $c \vee d$ is entailed.
2. [2 marks] (Proving validity) For each of the following formulas, either prove that it is valid or give a counterexample to its validity.
 - (a) $\exists x[P(x) \supset Q(a)] \supset \forall x[P(x) \supset Q(a)]$
 - (b) $\forall z(Q(z) \supset P(z)) \supset \exists x([(Q(x)) \supset P(a)] \wedge [(Q(x)) \supset P(b)])$
3. (6 marks) (Representing Knowledge)
 - (a) Question 3.10.2 in the text.
 - (b) Question 4.5.3 in the text.