NTNU

Kunnskap for en bedre verden

TDT4136 - INTRODUCTION TO ARTIFICIAL INTELLIGENCE

ASSIGNMENT 5

Propositional and First Order Logic

Name:

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Innholdsfortegnelse

1.   Models and entailment in propositional logic

1.1.   Validity and Soundness

(a) Generate the vocabulary of the following argument.

(b) Translate the argument into propositional logic statements.

(c) Add a premise (P4) to make the conclusion of the argument valid.

P1 to P3 are the premises, C is the conclusion:

- (P1) If Peter's argument is valid and all the premises of Peter's argument are true, then Peter's argument is sound.

- (P2) If the premises of Peter's argument entail the conclusion of Peter's argument, then Peter's argument is valid.

- (P3) The premises of Peter's argument entail the conclusion of Peter's argument.

- (C) Peter's argument is sound.

1.2.   Modelling

A sentence is satisfiable if it is true in or satisfied by some model.

(a) $(p \Rightarrow q) \Rightarrow (p \Rightarrow r) \Rightarrow (q \Rightarrow r)$

p	q	r	$p \Rightarrow q$	$p \Rightarrow r$	$q \Rightarrow r$	$(p \Rightarrow r) \Rightarrow (q \Rightarrow r)$	Total
0	0	0	1	1	1	1	1
0	0	1	1	1	1	0	0
0	1	0	1	1	0	0	0
0	1	1	1	1	1	1	1
0	0	0	1	1	1	1	1
0	0	1	1	1	1	1	1
1	1	0	1	1	0	0	0
1	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1
1	0	1	0	1	1	1	1
1	1	0	1	0	1	0	1
1	1	1	1	1	1	1	1

(b) $(p \vee (\neg q \Rightarrow r)) \Rightarrow (q \vee (\neg p \Rightarrow r))$

p	q	r	$\neg q \Rightarrow r$	$p \vee (\neg q \Rightarrow r)$	$\neg p \Rightarrow r$	$q \vee (\neg p \Rightarrow r)$	Total
0	0	0	1	1	1	1	1
0	0	1	1	1	1	0	0
0	1	0	1	1	0	0	0
0	1	1	1	1	1	1	1
0	0	0	1	1	1	1	1
0	0	1	1	1	1	1	1
1	1	0	1	1	0	0	0
1	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1
1	0	1	0	1	1	1	1
1	1	0	1	0	1	0	1
1	1	1	1	1	1	1	1

1.3. Modelling 2

2.   Resolution in propositional logic

2.1.   Conjunctive Normal Form

2.2.   Inference in propositional logic

3.   Representation in First-Order Logic (FOL)

3.1.   a) Argument A

3.2.   b) Argument B

4. Resolution in FOL