Artificial Intelligence 2019
Problem Sheet 6

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Notes

The homework serves as preparation for the exams. It is strongly recommended that you solve them before the given deadline - but you do not need to hand them in. Feel free to work on the problems as a group - this is even recommended.

1 Problem

Proof the following three Boolean equivalences:

- double negation: $\neg(\neg P) = P$
- De Morgan 1: $\neg(A \wedge B) = \neg A \vee \neg B$
- De Morgan 2: $\neg(A \vee B) = \neg A \wedge \neg B$

2 Problem

Given

- the $n+1$ PL sentences $\alpha_i (i \in \{1, ..., n\})$ and β
- the two knowledge bases $KB = \{\alpha_1 \wedge ... \wedge \alpha_n\}$ and $KB' = \{\alpha_1, ..., \alpha_n\}$,

i.e., KB consists of a single sentence that is the AND of the α_i and KB consists of n sentences in form of the α_i. Proof that $KB \vDash \beta$ iff $KB' \vDash \beta$.

3 Problem

Convert the following sentence into Conjunctive Normal Form:

$$(\neg(A \wedge B) \Rightarrow ((A \vee \neg B) \wedge C)) \wedge (C \Leftrightarrow \neg A \vee B)$$

4 Problem

Given the knowledge base $KB = \{P \Rightarrow Q, R \Rightarrow S\}$. Use Resolution with Refutation to proof the conclusion $P \vee R \Rightarrow Q \vee S$ from KB.

5 Problem

Given the knowledge base $KB = \{A, B, A \wedge B \Rightarrow C, C \Rightarrow D), C \Rightarrow E, E \wedge F \Rightarrow G\}$ of Horn Clauses. Use (Generalized) Modus Ponens to proof D as conclusion from KB.