Tutorial Artificial Intelligence WS 13/14 Wirtschaftsinformatik und Maschinelles Lernen (ISMLL) Ruth Janning, M.Sc., Carlotta Schatten M.Eng.

## Exercise Sheet 9

Submission: Monday, 20.01.2013, 23:00

## Exercise 1 Propositional Logic (4 Points)

a) Formulate the following natural language sentences as propositional logic formulas by using the following set:
 {alcool, beer, drunk, satisfied, healthy, liqueur, SparklingWine, Wine}
 of variables and the known propositional logic operators ¬, ∧, ∨, ⇒, ⇔

- Beer and Wine satisfy you and make drunk.
- One becomes drunk by drinking liqueur or sparkling wine.
- Drinking water makes not drunk and makes you healthy.
- Who is drunk has not drunk water but alcohol.

(4 Points)

## Exercise 2 Propositional Horn Formulas (8 points)

- a) Check if the following formula is satisfiable:  $(K \lor \neg L) \land (\neg N \lor \neg M) \land (M \lor \neg K \lor \neg L) \land (L) \land (\neg L \lor N \lor \neg K).$ Describe all your steps and draw the corresponding graph. (4 Points)
- b) One can understand and motivate by observing the single Horn clauses if the formula is satisfiable or not. Hint: have a look at clause L  $(K \lor \neg L) \land (\neg N \lor \neg M) \land (M \lor \neg K \lor \neg L) \land (L) \land (\neg L \lor N \lor \neg K)$ Motivate why this is true. (4 Points)

## Exercise 3 First Order Logic (4 Points)

- a) Write in First-Order-Logic following sentences:
  - Each human has a favorite animal and each animal has a favorite human.
  - Dogs are happy if they can eat or play.
  - The television is not working because the electricity is missing or because the device is broken.
  - Dragons exist if humans can see them.