

# Advanced Data Modeling

Summer Semester 2008  
- Exercises V -

To be handed in before **2008-06-01, 23:59** via e-mail to  
*sschenk@uni-koblenz.de*, subject line: [ADM] ...

- 1) Explain the term „range restricted clause“ with respect to the completion.
- 2) Prove that relational algebra has the same expressive power as non-recursive Datalog.
- 3) Are the following clauses range restricted?
  1.  $p(x, a) :- q(x, y, a), \text{not } r(y, a).$
  2.  $p(x, a) :- q(a, a, x), \text{not } r(x, y).$
  3.  $p(x, x) :- r(x, y).$
  4.  $p(x, y) :- y=a, \text{not } r(x, y).$
  5.  $p(x, y) :- y=a, \text{not } r(x, y), q(x, y, a).$
- 4) Model the following scenario using Datalog and draw a dependency graph:

There are different types of events: lectures, tutorials and seminars. Every event takes place in a certain room and has a start, an end time and a title. An event may have other events as prerequisites. Professors, students and research assistants are persons. Every person has a name and an e-mail address. Additionally, every professor has a working group and every research assistant works in a working group. Events are given by professors or research assistants. Every tutorial belongs to a lecture. Students attend events.

Is the resulting program in non-recursive Datalog?

- 5) Compute the least Herbrand models of the following programs using the immediate consequence operator  $T_P$ 
  1.  $p(a) :- p(x), q(x).$   
 $p(f(x)) :- p(x).$   
 $q(b).$   
 $q(f(x)) :- q(x).$
  2.  $p(a).$   
 $p(b).$   
 $q(c).$   
 $q(x) :- \text{not } r(x, b).$   
 $r(x, x) :- p(x).$
  3.  $p_1(f(x)) :- p_1(x).$   
 $p_2(a) :- p_1(x).$   
 $p_2(f(x)) :- p_2(x).$   
 $p_3(a) :- p_2(x).$   
 $p_3(f(x)) :- p_3(x).$   
 $p_4(a) :- p_3(x).$   
 $p_4(f(x)) :- p_4(x).$   
 $p_5(a) :- p_4(x).$