Introduction to Computational Linguistics SS16 - Homework Assignment 4
Due: Before the beginning of the lecture on **09.06.2015**

- Must not be handed in individually but **by workgroup**. Each submission must contain the names of all workgroup participants.
- Identical solutions from different workgroups will not receive credit (so don't copy the solutions from other workgroups and don't allow others to copy your solution).
- Pls. hand in in the form of a PDF document sent to your tutor by email.

1. a. Suppose the denotation of "and" and "or" are described with the help of lambda abstraction, that is ⟦and⟧ and ⟦or⟧ are both members of $D_{<t,<t,t>>}$. They are functions that map truth values into functions from truth values to truth values. Specify the two functions using the λ-notation.

b. Try to formulate the denotation for "while", also in lambda notation, for those uses of "while" where it is used to connect two sentences expressing an opposition, as in "Jan works, while Mary sleeps" (you can ignore the temporal meaning that is given in the paraphrase "Jan works at a time where Mary sleeps"). Do this with the formal means that you already know, and if they are not sufficient, add informal comments in English. Note that we only look at the contribution that the denotation of words makes to the truth conditions of sentences in which they occur, and not at any other aspects of meaning.

c. Comment informally on how ⟦while⟧ differs from ⟦and⟧.

2. Replace the "?" in each of the following statements (you may want to review our definitions of semantic types before tackling this exercise):

(a) $[\lambda f \in D_{<e,t>} . [\lambda x \in D_e$ .f(x) = 1 and x is fast]] $\in D_{<?>}$

(b) $[\lambda f \in D_{<e,<e,t>>} . [\lambda x \in D_e$ .f(x)(Ann) = 1]] $\in D_{<?>}$

(c) $[\lambda f \in D_{<e,t>}$. there is some $x \in D_e$ such that f(x) = 1] $\in D_{<?>}$

(d) $[\lambda y \in D_e . [\lambda f \in D_{<e,t>} . [\lambda x \in D_e$. f(x) =1 and x is in y]]] $\in D_{<?>}$

(e) $[\lambda f \in D_{<e,t>}$. Mary] $\in D_{<?>}$

(f) $[\lambda f \in D_{<e,t>} . [\lambda g \in D_{<e,t>}$. there is no $x \in D_e$ such that f(x) = 1 and g(x) = 1]] $\in D_{<?>}$

3. a. Try to find a clear and unambiguous description in plain English, or in set-theoretic terms, of the semantic effect that the adjective "former" has on the denotation of a noun that it combines with, as , e.g., in "former doctor".

b. If you can manage, give also a formalization that could be used as a formal lexical entry. If not, don't worry.

c. Compare the semantic effect that "former" has to the effect of "grey" and "good". What are the differences?