

# Assignment 2, Statistical Methods in Applied Computer Science, Fall 2014, Due Dec 16

December 1, 2014

1. (4p) Provide an algorithm for counting the number of maximum weight independent sets in a tree  $T$  given together with edge weights  $w : V(T) \rightarrow R$ . Provide an algorithm for counting the number of maximum size independent sets in a graph given together with a junction tree  $(T, B)$  of width  $w$ . Both algorithms should be polynomial in the size of the input but may be exponential in  $w$ . You only have to hand in the algorithm for graphs (but also handing in only the one for trees will give points).
2. (4p) Provide an algorithm for uniformly generating a maximum weight independent sets in a tree  $T$  given together with edge weights  $w : V(T) \rightarrow R$ . Provide an algorithm for uniformly generating a maximum size independent sets in a graph given together with a junction tree  $(T, B)$  of width  $w$ . Both algorithms should be polynomial in the size of the input but may be exponential in  $w$ . You only have to hand in the algorithm for graphs (but also handing in only the one for trees will give points).
3. (4p) Let  $(G, \psi_i)$  be a UGM. Supposed that we have evidence  $x_e$  for a subset of the variables  $e$ . Provide an algorithm for generating values for the variables  $X_{V \setminus e}$  according to the distribution  $P(X_{V \setminus e} | x_e, (G, \psi_i))$  in the following cases (1)  $G$  is a tree  $T$  and (2)  $G$  is a graph given together with a junction tree  $(T, B)$  of width  $w$ . Both algorithms should be polynomial in the size of the input but may be exponential in  $w$ . You only have to hand in the algorithm for case (2) (but also handing in only the one for case (1) will give points).