Bayesian Network
Proposed algorithm for answering query

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Abstract

Given a Bayesian network, our goal is to answer queries as faster as possible. The meaning of faster, in the case of this work, is the smallest number of addition and multiplication. The algorithm variable elimination is the starting point. The goal of this research is to improve the algorithm without loss of his characteristics.

Foreword

To illustrate the algorithm, some example are provided. Then, here is the Bayesian network in use:

Var	Values	Parents	CPT
A	true, false	none	=true,0.1
B	true, false	none	=true,0.2
C	true, false	A	true,=true,0.3 false,=true,0.6
D	true, false	A	true,=true,0.3 false,true,0.9
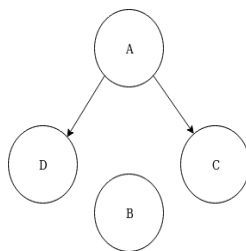
1 Choosing the significant variables

1. Create a new set with all the hidden variables, and the variable we're asking for in the query.

2. For all the variable in the set, add all the ancestor variables, such that no one is displayed in the query.

Example:
For the query: $P(C = true|A = true, B = true)$
1. The set is {D, C}
2. For D, the ancestor variable is A, but A is displayed in the query. Same for C.

For the query: $P(C = true|A = true, B = true, D = true)$
1. The set is {C}
2. Since all the variable are in the query, there is no variable to add by default.

For the query: $P(B = true|C = true)$
1. The set is {A, D}
2. The variables A and D have no parent, so no variable is added.

2 Join and eliminate

1. From the previous set, choose one variable except the variable we're asking for in the query.

2. Do join as in the variable elimination algorithm.

3. Do eliminate as in the variable elimination algorithm.

4. Return to 1, until all the variable are eliminate and the only remain variable is the variable we're asking for.

3 Normalize

Normalize the last factor, and the algorithm is finish.