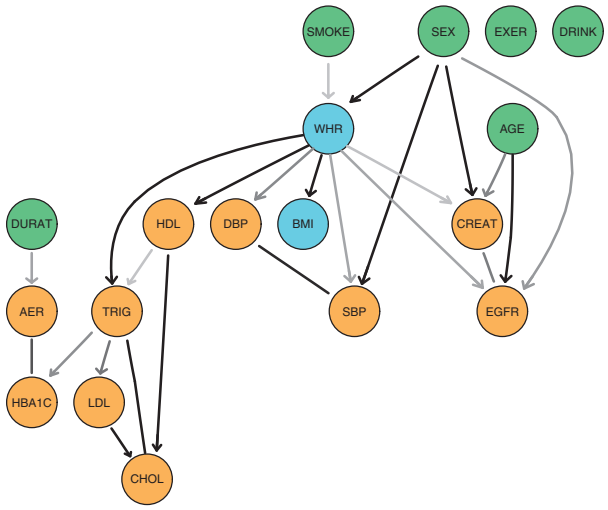
Learning the topology of a Bayesian Network
from a database of cases using the K2 algorithm

A Bayesian belief-network [1] structure is a directed acyclic graph in which nodes represent domain variables and arcs between nodes represent probabilistic dependencies [2]. Given a database of records, it is interesting to construct a probabilistic network which can provide insights into probabilistic dependencies existing among the variables in the database. Such network can be further used to classify future behaviour of the modelled system [2]. Although researchers have made substantial advances in developing the theory and application of belief networks, the actual construction of these networks often remains a difficult, time consuming task. An efficient method for determining the relative probabilities of different belief-network structures, given a database of cases and a set of explicit assumptions is described in [2] and [3].



The K2 algorithm [3] can be used to learn the topology of a Bayes network [2], i.e. of finding the most probable belief-network structure, given a database.

Part 1 After having studied the problem in the suggested literature ([2]-[3]), Implement the algorithm in R and check its performances with the test data set given in [3].

Part 2 Implement and test the K2 algorithm with the test data sets ([3]). Investigate if it is possible to code it inside the `bnstruct` R package [4]-[5].

Bibliography

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