Bayesian Networks and Influence Diagrams: A Guide to Construction and Analysis

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Answers to Exercises

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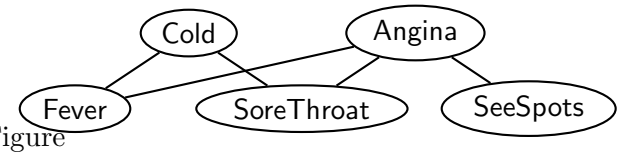
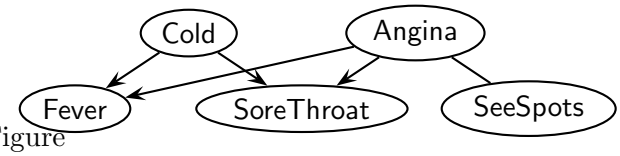
Answer to Exercise 8.1: The exerise is based on the Angina network.

(a) See Figure

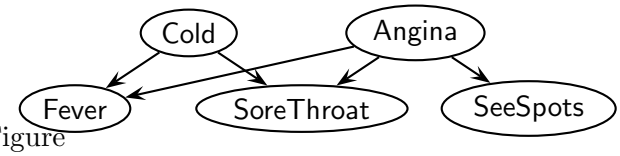


(b) See Figure



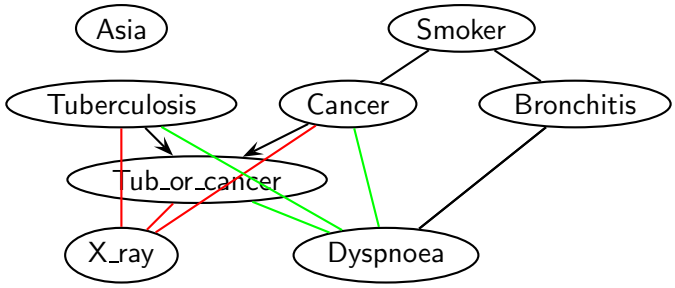
(c) Same as (b)

(d) See Figure



Answer to Exercise 8.2: The solutions include a sample data set. Using this data set with $\alpha = 0.05$, the solutions to the exercise are as follows.

(a) The figure below shows the PDAG obtained running the NPC algorithm on the data sample.



(b) Two minimal resolutions exists ((Tuberculosis, Tub_or_cancer) and (Cancer, Tub_or_cancer).

(c) See figure below.

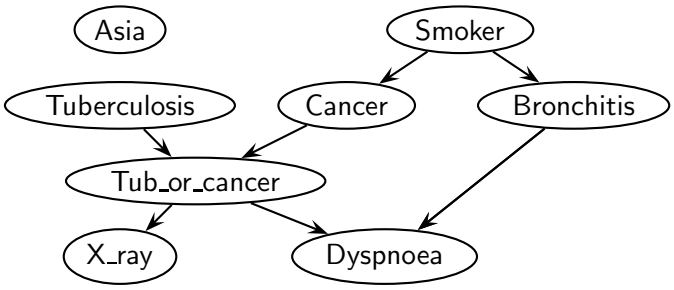
(d) This is done using the EM learning algorithm.

Answer to Exercise 8.3: We assume all variables to binary

(a) $AIC = l(\Theta) - \kappa = -964 - 12 = -952$

(b) $BIC = l(\Theta) - \frac{1}{2}\kappa \log(N) = -964 - \frac{1}{2} \cdot 12 \cdot \log(1000) = -964 - 41.4 = -1005.4$

(c) The penalization term takes the number of cases into account. This makes $BIC < AIC$ in most cases.



Answer to Exercise 8.4:

(a) The structure is a Naive Bayes and the conditional probability distributions are obtained by normalizing the sufficient statistics.

(b) $\mathsf{P}(\mathsf{Class} = \mathsf{edible} | \mathsf{Odor} = \mathsf{none}) = 0.9694$.