COMP9418 Quiz 1

Advanced Topics in Statistical Machine Learning, 17s2, UNSW Sydney

Last Update: Thursday 3rd August, 2017 at 11:56

Submission deadline: Tuesday August 8th, 2017 at 23:59:59

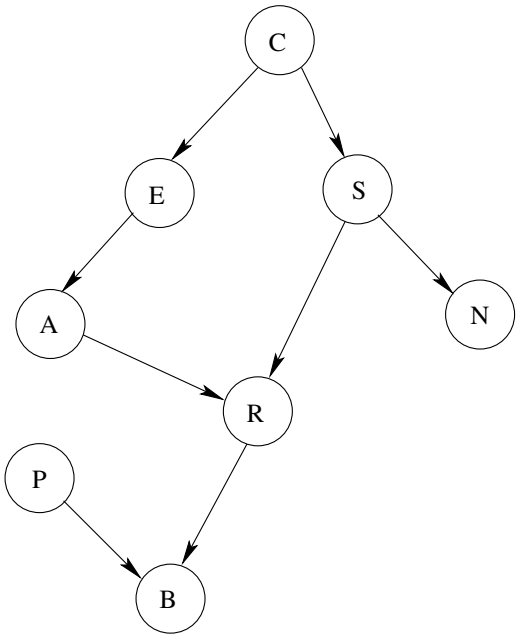
Late Submission Policy: One mark will be deducted from the total for each day late, up to a total of four days. If five or more days late, a zero mark will be given.

Form of Submission: You should submit your solution in one single file in pdf format with the name `solution.pdf`. No other formats will be accepted (scanned versions of legible handwritten answers are accepted). There is a maximum file size cap of 2MB so make sure your submission does not exceed this size.

Submit your files using give. On a CSE Linux machine, type the following on the command-line:
`$ give cs9418 quiz1 solution.pdf`
Alternative, you can submit your solution via the course website
`https://webcms3.cse.unsw.edu.au/COMP9418/17s2/resources/9748`

Recall the guidance regarding plagiarism in the course introduction: this applies to this homework and if evidence of plagiarism is detected it may result in penalties ranging from loss of marks to suspension.

1. Consider the following Bayesian network:



(a) [0.5 marks] Write down the corresponding joint distribution.

(b) [0.5 marks] Using the concept of *d-separation* check the validity of $A \perp\!\!\!\perp N \mid B$, i.e. are A and N conditionally independent given B? Explain your reasoning.

(c) [1 mark] Moralise the graph.

(d) [1 mark] Triangulate the graph via the *elimination algorithm* and provide an optimal elimination order, i.e. an order with the minimum tree width (size of the largest clique). Show all your working.

(e) [1 mark] Construct a valid junction tree.

(f) [1 mark] Imagine that you have run the JTA until completion without evidence. Now I tell you that $R = r$ has been observed. Is it possible to compute $p(S, A|R = r)$ without running the JTA again? Explain your reasoning.