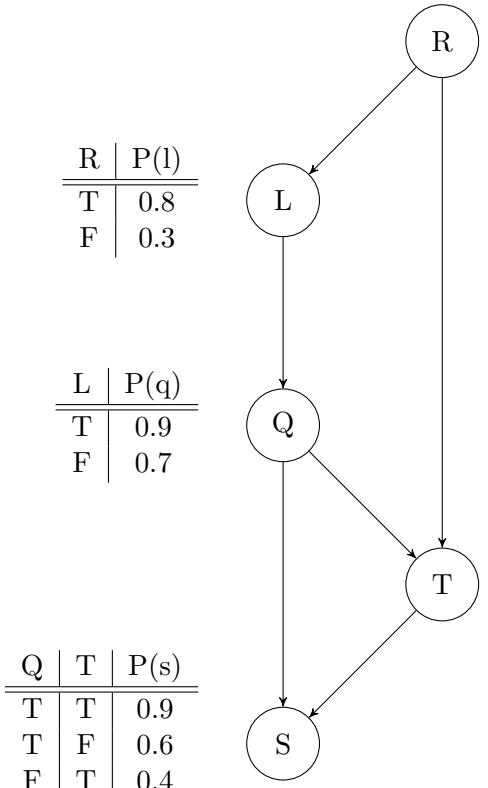
Bayesian Network Practice Questions

Week 13

Question 1

Consider the following Bayesian network:



P(r)
0.2

R	P(l)
T	0.8
F	0.3

L	P(q)
T	0.9
F	0.7

Q	R	P(t)
T	T	0.7
T	F	0.9
F	T	0.2
F	F	0.3

Q	T	P(s)
T	T	0.9
T	F	0.6
F	T	0.4
F	F	0.1

R : it is **raining**
L : there are juicy **leaves**
Q : the **quokkas** are happy :D
T : there are lots of **tourists**
S : people are taking lots of quokka **selfies**

1. What is the probability that there are lots of tourists? Calculate this in two ways:
   (a) with enumeration (with improvement, see slide 59 W11)
   (b) with variable elimination
2. What is the probability that the quokkas are happy, given there are lots of quokka selfies being taken and it's not raining? (Do this using variable elimination)
3. BAYESed on your answer to the previous question, classify the quokkas as happy or not, given the above evidence.
4. (extra practice) Calculate $P(r \mid \neg l, s)$ (Note: there is an answer but no worked solution)
5. (extra practice) Calculate $P(l \mid q, t, s)$ (Note: there is an answer but no worked solution)

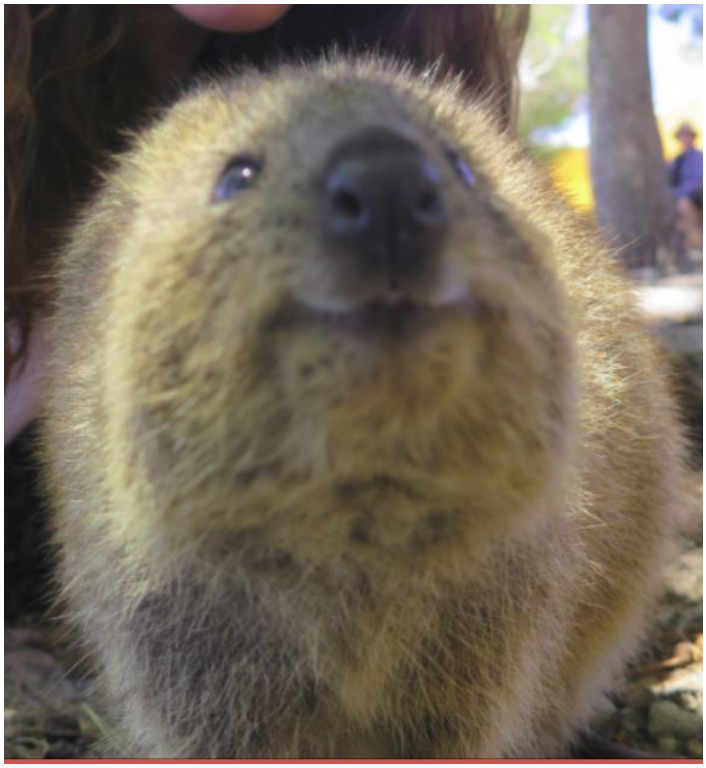


Figure 1: A happy quokka

Question 2 (Advanced)

Consider the Bayesian Network shown in Figure 2. Prove that, with no evidence, U is independent of O by

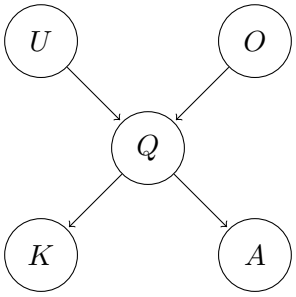


Figure 2: Quokka network

showing: $P(U, O) = P(U)P(O)$