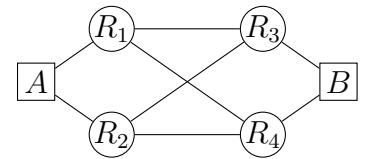


- Urn A has 4 blue balls. Urn B has 1 blue ball and 3 red balls.
 - You draw a ball from a random urn and it is blue. What is the probability that it came from urn A?
 - You draw another ball from the same urn. What is the probability that the second ball is also blue?

- Computers A and B are linked through routers R_1 to R_4 as in the picture. Each router fails independently with probability 10%.



- What is the probability there is a connection between A and B ?
 - Are the events “there is a connection between A and B ” and “exactly two routers fail” independent? Justify your answer.
- A bus takes you from A to B in 10 minutes. On average a bus comes once every 5 minutes. A taxi takes you in 5 minutes, and on average a taxi comes once every 10 minutes. Their arrival times are independent exponential random variables. A bus comes first.
 - If you want to minimize the (expected) travel time, should you take this bus?
 - If you do take the bus, what is the probability that you made the wrong decision?
 - 10 people toss their hats and each person randomly picks one. The experiment is repeated one more time.
 - What is the probability that Bob picked his own hat both times?
 - Let A be the event that at least one person picked their own hat both times. True or false: $P(A) > 25\%$? Justify your answer.
 - X is a $\text{Normal}(0, \Theta)$ random variable, where the prior PMF of the parameter Θ is $P(\Theta = 1/2) = 1/2$, $P(\Theta = 1) = 1/2$. You observe the following three independent samples of X : 1.0, 1.0, -1.0.
 - What is the posterior PMF of Θ ?
 - What is the MAP estimate of Θ ?
 - What is the posterior probability that $|X| \geq 1$?