Dina Ladnyuk Week 8 Graded Assignment- 1

Ninety-nine per cent of the restaurants in Kentish Town practice good hygiene. Each time you eat in a clean restaurant, there is a 1 per cent chance that you will get sick, independent of your previous visits. On the other hand, each time you eat in a restaurant that does not practice good hygiene, there is a 50 per cent chance that you will get sick, independent of your previous visits.

**1.You eat at a restaurant in Kentish Town and you get sick. What is the probability that the restaurant practices good hygiene?** Hint: using the law of total probability, first calculate the probability of the event `falling sick'. You can use this probability in your subsequent application of Bayes' theorem.

**P(good\_hygiene | get\_sick) = P(get\_sick | good\_hygiene) \*P(good\_hygiene) / P(get\_sick)**

**P(get\_sick) = 0.99\*0.01 + 0.01 \* 0.5 = 0.0149**

**P(good\_hygiene) =0.99**

**P(get\_sick | good\_hygiene) = 0.01**

**P(good\_hygiene | get\_sick) = 0.01 \* 0.99 / 0.0149 = 0.66**

**P(good\_hygiene | get\_sick) =66%**

**2. You go to the same restaurant for a second time and you get sick again. What is the probability of the restaurant practicing good hygiene now?** Hint: using the law of total probability, first calculate the probability of the event `falling sick twice'. In this calculation, you can use the conditional independences : P(falling sick once | restaurant clean )^2 = P(falling sick once | restaurant clean)^2 and P(falling sick twice | restaurant not clean) = P(falling sick once | restaurant not clean)^2 You can use these probabilities in your subsequent application of Bayes' theorem, where you can again use the same conditional independence.

**P(good\_hygiene | get\_sick\_twice) = P(get\_sick\_twice | good\_hygiene) \* P(good\_hygiene) / P(get\_sick\_twice)**

**P(get\_sick\_twice) = 0.99 \* 0.01^2 + 0.01 \* 0.5^2 = 0.0026**

**P(good\_hygiene) = 0.99**

**P(get\_sick\_twice | good\_hygiene) = P(get\_sick | good\_hygiene) ^ 2 = 0.01 ^ 2 = 0.0001**

**P(good\_hygiene | get\_sick\_twice) = 0.0001 \* 0.99 / 0.0026 = 0.038**

**P(good\_hygiene | get\_sick\_twice) =3.8%**