

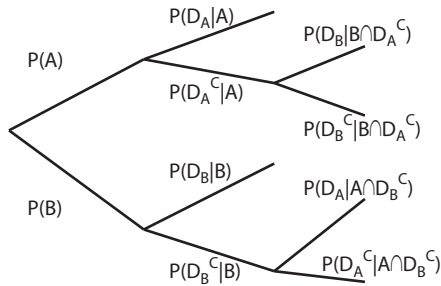
ECEn 370 (Probabilistic Dating Analysis)

Quiz 2 Solutions

Friday, January 15, 2010.

1. It is Friday and after ECEn 370 you want to find a date for tonight and there are two people, A and B , you would like to ask. The probability that A will accept an invitation (in person, no texting in this example) is $\frac{3}{10}$. The probability that B will accept an invitation is $\frac{2}{3}$. You randomly select one of the two and extend an invitation. If you are rejected, then you go to the other person and extend an invitation. We make the following assumptions: (1) you can only end up with one date tonight and (2) once you are rejected, you can't ask the same person again tonight.

a) What is the probability that you will have a date with person A tonight?



$$P(D_A) = P(A)P(D_A|A) + P(B)P(D_B^c|B)P(D_A|B \cap D_B^c) = \frac{1}{2} \cdot \frac{3}{10} + \frac{1}{2} \cdot \frac{1}{3} \cdot \frac{3}{10} = \frac{3}{20} + \frac{1}{20} = \frac{1}{5}$$

$$P(D_B) = P(B)P(D_B|B) + P(A)P(D_A^c|A)P(D_B|A \cap D_A^c) = \frac{1}{2} \cdot \frac{2}{3} + \frac{1}{2} \cdot \frac{7}{10} \cdot \frac{2}{3} = \frac{1}{3} + \frac{7}{30} = \frac{17}{30}$$

b) What is the probability that you will have a date tonight?

This can be done by adding up $P(D_A)$ and $P(D_B)$ or it can also be done by finding the probability that there is no date tonight:

$$P(D) = (1 - \frac{3}{10})(1 - \frac{2}{3}) = \frac{7}{10} \cdot \frac{1}{3} = \frac{7}{30}$$

The probability that you have a date tonight is thus $1 - \frac{7}{30} = \frac{23}{30}$

2. Your friend is also thinking about asking the same people, A and B , out tonight but doesn't know the results of the experiment above. He asks you and you only confirm that you have a date tonight. What is the probability that given that you have a date, it is with person B ?

$$P(D_B|D_A \cup D_B) = \frac{P(D_B \cap (D_A \cup D_B))}{P(D_A \cup D_B)} = \frac{P(D_B)}{P(D_A \cup D_B)} = \frac{\frac{17}{30}}{\frac{1}{5} + \frac{17}{30}} = \frac{17}{6+17} = \frac{17}{23}$$