Homework: Information   Economics 304

1) Joe's search costs are $5 per search. He wants to buy skis for his wife for Christmas, and the lowest price he's found so far is $300. Joe thinks 80 percent of the stores charge $300 for skis and 20 percent charge $200. What is Joe's optimal decision? Explain.

The benefits from searching is the expected value compared to $300
Expected benefits of search = ($300-$300)*0.8 + ($300 - $200)*0.2 = $20

The Cost of searching is $5. So the benefits of another search are greater than the cost of another search. i.e. E(benefits) > E(cost) $20 > $5

2) Tim wants to buy a bike as a gift for his niece's birthday. He knows that the same product is offered in different shops with prices of $120, $100, and $80 with odds of one-third of finding each price. He just stopped at a shop and knows that the price is $100. Suppose that there is a search cost of $5 for each search. Should he search one more time? Explain.

Expected benefits for searching = 0.3333*(100-120) + 0.3333*(100-100) + 0.3333*(100-80) = 0

Cost of searching is $5, so Tim should not continue searching because the expected costs are higher than the expected benefits.

3) BK Books is an online book retailer that also has 10,000 "bricks and mortar" outlets worldwide. You are a manager within the Corporate Finance Division and are in dire need of a new financial analyst. You only interview students from the top MBA programs in your area. Thanks to your screening mechanisms and contacts, the students you interview ultimately differ only with respect to the wage that they are willing to accept. About 10 percent of acceptable candidates are willing to accept a salary of $140,000, while 90 percent demand a salary of $190,000. There are two phases to the interview process that every interviewee must go through. Phase 1 is the initial one-hour on-campus interview. All candidates interviewed in Phase 1 are also invited to Phase 2 of the interview, which consists of a five-hour office visit. In all, you spend six hours interviewing each candidate and value this time at $2,500. In addition, it costs a total of $8,000 in travel expenses to interview each candidate.   You are very impressed with the first interviewee completing both phases of BK Books's interviewing process, and she has indicated that her reservation salary is $190,000.

Should you make her an offer at that salary or continue the interviewing process?

The expected benefit from an additional search is 0.10*($190,000 - $140,000) = $5,000, while the cost of another search is $10,500. Therefore, make her an offer.

We would also want to make some assumption on the length of time people were normally in this job. If the company expects to keep the new hire for several years, you would also want to take that into consideration. To do this you would think about the time value of money, which is covered in a variety of other classes e.g. finance, accounting and managerial economics.

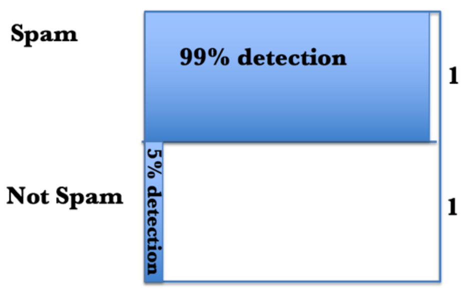
4) It is estimated that 50% of emails are spam emails. Some software has been applied to filter these spam emails before they reach your inbox. A certain brand of software claims that it can detect 99% of spam emails, and the probability for a false positive (a non-spam email detected as spam) is 5%.

Now if an email is detected as spam, then what is the probability that it is in fact a spam email?

a. Show this both using the formula for Baye's theorem as well as visually (e.g. the box show in class for math vs. business student)
b. How would this calculation change if you wanted to know the probability that an email detected as spam is actually not spam?

a) $P(spam|detection) = \frac{signal*prior}{(signal*prior)+(noise*(1-prior))}$

$$P(spam|detection) = \frac{0.99*0.5}{(0.99*0.5)+(0.05*(0.5))} = 0.95$$



Prior = 1 spam for every 1 not spam

Spam and Detected = 90%

Not Spam and Detected = 5%

Compare relative rectangles

	Spam	Not Spam
Prior	1	1
Likilhood	99	5
Posterior	**99**	**5**
	19.8	**1**

P(Spam | Detected) = 95% chance

b) $P(notspam|detection) = \frac{0.5*0.5}{(0.99*0.5)+(0.05*(0.5))} = 0.05$

Also, the probabilities need to add up to 1 ie. 95% in part A, therefore 5% in part B

5) An insurance company classifies insured drivers into accident prone or non-accident prone. Their current risk model works with the following probabilities.

An accident prone insured driver has an accident within a year 40% of the time, while the non-accident prone insured driver has an accident with probability 20% within a year. Furthermore, 30% of the population is accident prone.

Suppose now that a policy holder has had accident within one year. What is the probability that he or she is accident prone?

$$P(accident\ prone|in\ an\ accident) = \frac{0.3*0.4}{(0.3*0.4)+(0.2*(0.7))} = 0.46$$

Likelihood of being accident prone given the policy holder was in an accident is 46%