Department of Computer Science

California State University, Channel Islands

MATHCOMPPH-546: Lesson 4 phys546 Feature Extraction HW_4A

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4.2 (a) What is the probability of getting at least one “6” if three dice are rolled?

(b) What is the probability of getting at least one “6” in four rolls of a single die?

(c) What is the probability of getting at least one double-6 in 24 throws of a pair of dice?

Ans.

(a) P=1- probability of no 6=1-(5/6)^3=0.421
(b) P=1- probability of no 6=1-(5/6)^4=0.518
(c) P=1- probability of no double 6=1-((5/6)*(5/6)+2*(5/6)*(1/6))^24=0.491

4.5 Suppose that a rare disease affects 1 out of every 1,000 people in a population, i.e., the prior probability is 1/1,000. And suppose that there is a good, but not perfect, test for the disease. For a person who has the disease, the test comes back positive 99% of the time (sensitivity 1⁄4 0.99) and if for a person who does not have the disease the test is negative 98% of the time (specificity 1⁄4 0.98). You have just tested positive; what are your chances of having the disease? (Try by calculation, and then check using CondProb.xls).

Ans. P(test positive) = P(have disease and tested positive) + P(not have disease and tested positive) = (1/1000)*0.99 + (999/1000) * 0.02 = 0.02097 therefore

P(having this disease given tested positive) = P(have disease and tested positive)/P(tested positive) = (1/1000)*0.99/0.02097 = **0.0472**

4.6 Consider the situation discussed in Example 4.3 in the text. The woman in question tested positive and her posterior probability of having breast cancer was calculated to be 7.76%. If she decides to go for another test and she tests positive a second time, what is the probability of her having breast cancer? (And what if a third, fourth, fifth test was positive, what would the corresponding probabilities be? Of course, this is an unlikely scenario since each test exposes her to X-rays and a consequent risk of actually causing cancer.) (Try by calculation, and then check using CondProb.xls.)

Ans. I don't believe the dollar amount has any bearing on how many people you tested and got a positive result.

If the percentages in the example have changed from 1% to 3%, and the false positive rate has increased from 9.6% to 15%, etc (I considered as just examples for my explanation the numbers may be any value either less or more).

7.76 percent is a fluctuating figure.

If we repeat the experiment 1000 times and the findings are positive, the chance of 7.76 percent remains the same.