Q: P(D | P)

Note Title 1/21/2011

HW3 Q10 Problem 2.80

Computer chips: 50% from Factory A
10% from Factory B
40% from Factory C

We know that chips from A has defective rate 0.005
---- B ... 0.001
C ... 0.010

Q: P(it is from A | a chip is defective)

Ans:

Q: Can we derive a formula to speed-up the counting process?

Theorem 1:

Theorem 2:

For our example HW3 Q10,

"A":

"B_1, B_2, B_3": are the partition that

(Mutually exclusive & covers the entire sample space)

$P(B_1 | A) =$

Two events are independent

① Physically not related

ex: the temperature today vs. the lottery number.

② In this course, we use a different, _____ to say two events are independent.

Ex: Two virtual coins generated by a single computer/ iphone.

The outcomes are physically related, generated by the same program

Nonetheless, if we count the freq of the outcomes

X \ Y	0	1
0	$\approx \frac{1}{4}$	$\approx \frac{1}{4}$
1	$\approx \frac{1}{4}$	$\approx \frac{1}{4}$

* It is no different than two physical coins.

* then we say the two coins are independent (even though they are physically related)

A formal definition of independence is

or equivalently

Namely, conditioning on knowing whether B happens or not, does not change the freq of A happens.

Example: Are "the NY Stock Index" & the "weather of NYC" independent?

Suppose the historically data shows that

NYSE	Snow	Not snow
↓	$\frac{1}{75}$	$\frac{24}{75}$
↑	$\frac{1}{100}$	$\frac{59}{100}$

* A & B are independant if
(or equivalently)

Another Example: Consider 1 fair coin X
& 1 unfair coin Y with
$P(Y=0)=0.3$ $P(Y=1)=0.7$.

Suppose X & Y are independent

Q: Find the W.A.

Q: $P(Y=0 \mid X+Y \leq 1)$

Ans:

Part of HW3Q12

Consider X is a discrete R.V with sample space $\{0, 1, 2, 3\}$ and weight assignment $\frac{1}{8}, \frac{3}{8}, \frac{3}{8}, \frac{1}{8}$

$p_0 \quad p_1 \quad p_2 \quad p_3$

Consider another independent R.V Y that also has $S = \{0, 1, 2, 3\}$ and W.A. $\frac{1}{8}, \frac{3}{8}, \frac{3}{8}, \frac{1}{8}$.

Suppose X and Y are <u>independent</u>.

Q What is the W.A when we consider jointly (X, Y)

Q: $P(X = Y)$?

Ans:

Showing/proving 2 events A, B are indep
$\equiv$ Showing

Showing/proving 3 events A, B, C are indep
$\equiv$ showing

HW3Q13
2 independent fair coins X, Y,
& 1 magic coin

$$M = \begin{cases} 1 & \text{if } X \neq Y \\ 0 & \text{if } X = Y \end{cases}$$

Consider 3 events
$A: \{X=1\}$, $B: \{Y=1\}$, $C: \{M=1\}$

Q: What is the sample space?

Ans:

Q: $P(C) = P(M=1) = ?$

Ans:

Q: Are A, C independent?

Ans

Q: Are A, B, C independent?

Ans

The hard drive example

Ans to Q1:

Ans to Q2:

Ans to Q3:

For repetition codes

Ans to Q1:

Q2

Ans to Q3: