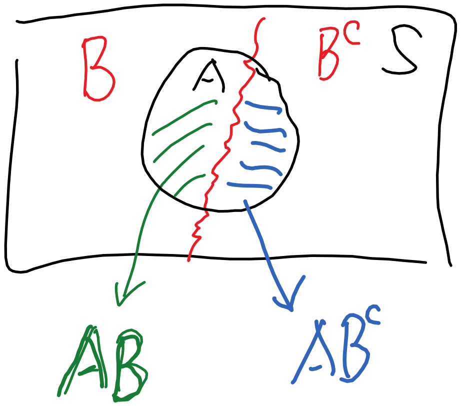
$P(A|B) = P(AB)/P(B)$ $\leftarrow$ $P(AB) = P(A|B) \cdot P(B)$

Wednesday, August 20, 2014 12:00 PM



$P(A)$?

$$P(A) = P(AB) + P(AB^c)$$
$$= P(A|B)P(B) + P(A|B^c)P(B^c)$$

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- A man shoots a target. When sunny day, he has 0.8 prob. to hit the target; when raining day, he has 0.4 prob. to hit. The weather has 0.7 prob. to be sunny, and 0.3 prob. to be raining.
  The man shoots today. What is the chance that he hits the target today?

① model.

A: today is sunny. $\bar{A}$: today is raining

E: hit target today

Q: $P(E)$?

$P(E|A) = 0.8$, $P(E|\bar{A}) = 0.4$

$P(A) = 0.7$, $P(\hat{A}) = 0.3$

② analysis,

$P(E) = P(E|A)\cdot p(A) + P(E|\bar{A})\cdot p(\bar{A})$

$= 0.8 \times 0.7 + 0.4 \times 0.3 = 0.68$

- In a gamble game, there are three cards, two are blank and one has sign. They are folded and put on table, and your task is to pick the signed card. First, you pick one card. Then, the casino player will remove one blank card from the remaining two. Now you have the option to change your pick, or stick to your original pick. Which option should you take? What is the probability of each option?

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① Model:

R_1 : pick right at first round.

W_1 : " wrong " " "

Second-round

S : stick to first pick and win

C : change pick and win

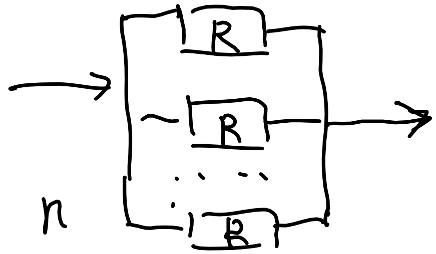
$P(R_1) = 1/3$ $\quad P(W_1) = 2/3$

Q: $P(S)$? $\quad P(C)$?

$$P(S) = P(S|R_1)\cdot P(R_1) + P(S|W_1)\cdot P(W_1) = 1 \times \frac{1}{3} + 0 \times 2/3 = \frac{1}{3}$$

$$P(C) = 1 - P(S) = \frac{2}{3}$$

$$P(C) = P(C|R_1)\cdot P(R_1) + P(C|W_1)\cdot P(W_1)$$



$p(\text{systeem works})$

$= p(\text{at least one of them works})$

$= 1 - p(\text{all fail})$

$= 1 - p(\text{1st fail} \cap \text{2nd fail} \cap \cdots)$

$= 1 - p(\text{1st fail}) \cdot p(\text{2nd fail}) \cdot p(\text{3rd}) \cdots$

$= 1 - (1-R)^n$

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$$P(A|B) = \frac{P(B|A)P(A)}{P(B)}$$

$$= \frac{P(B|A)P(A)}{P(B|A)P(A)+P(B|A^c)P(A^c)}$$

$P(B)$

law of total prob.

$$P(A|B) = \frac{P(B|A) \cdot P(A)}{P(B)}$$

$$P(A|B) = \frac{P(AB)}{P(B)}$$

$$P(B|A) = \frac{P(AB)}{P(A)}$$

$$P(AB) = P(B|A) \cdot P(A)$$

Wednesday, August 20, 2014 1:05 PM

A man shoots a target. When sunny day, he has 0.8 prob. to hit the target; when raining day, he has 0.4 prob. to hit. The weather has 0.7 prob. to be sunny, and 0.3 prob. to be raining.

Q: the man misses the target today, what is prob. that today is sunny? Raining?

① Model:

hit $\overline{hit}$, sun, rain

$p(hit \mid sun) = 0.8$

$p(hit \mid rain) = 0.4$

$p(sun) = 0.7$ $p(rain) = 0.3$

Q: $p(sun \mid \overline{hit})$, $p(rain \mid \overline{hit})$

$$p(sun \mid \overline{hit}) = \frac{p(\overline{hit} \mid sun) \cdot p(sun)}{p(\overline{hit})} = \frac{0.2 \times 0.7}{p(\overline{hit})} = \frac{0.14}{0.32} = 0.4375$$

$$p(\overline{hit}) = p(\overline{hit} \mid sun) \cdot p(sun) + p(\overline{hit} \mid rain) \cdot p(rain) = 0.2 \times 0.7 + 0.6 \times 0.3 = 0.32$$