Knowledge discovery in data mining
Probability H.W.

Homework

1.1. Jerry goes to the bank 20% of the day

$= 0.2$

Susan goes 30% of the day $= 0.3$

$P(J) = 0.2$; $P(S) = 0.3$; $P(J+S) = 0.08$

a) $P(J/S) = \frac{P(J \cap S)}{P(S)} = \frac{0.08}{0.3} = \frac{0.8}{3} = \underline{\underline{0.26}}$

b) ~~$P(J/(1-S)) = \frac{P(J \cap S)}{1-P(S)} = \frac{0.08}{1-0.3} = \frac{0.08}{0.7} = \frac{0.8}{7}$~~

~~$= \underline{\underline{0.11}}$~~

b) $P(J/\text{Susan was not there}) =$

$P(J-S) = 0.12$

So, $P(J/\text{Susan was not there}) = \frac{0.12}{1-0.3}$

$= \frac{0.12}{0.7} = \frac{1.2}{7} = \underline{\underline{0.17}}$

c) P(atleast one of them is there) =

$P(0.22 + 0.08 + 0.12) = 0.42$

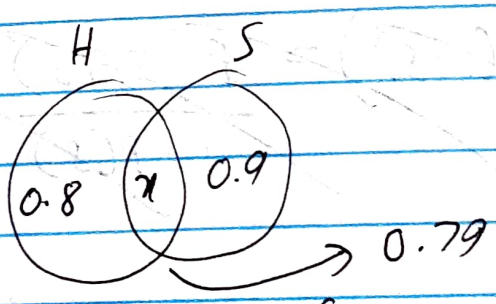
So, P(atleast one / both were there)

$= \frac{0.08}{0.42} = \frac{1.9}{}$

Homework

1.2 $P(H) = 0.8$; $P(S) = 0.9$

P(atleast one) = 0.91



$\Rightarrow (0.8 - x) + x + (0.9 - x) = 0.91$

$\Rightarrow 0.8 + 0.9 - x = 0.91$

$\Rightarrow 0.8 + 0.9 - 0.9 = x$

$\Rightarrow x = 0.79$

a) So, P(only Harold) = 0.8 - 0.79

= 0.1 or 1%

b) P(only Sharon) = 0.9 − 0.79
= 0.11 or 11%

c) P(both won't get a 'B') =

100 − (1 + 79 + 11) = 100 − 91
= 9% = 0.09.

mework
1.3 P(J) = 0.2 ; P(S) = 0.3 ; P(J ∩ S) = 0.08

To check if 2 events are conditionally independent.

P(J ∩ S) = P(J) * P(S)
0.08 = 0.3 * 0.2
0.08 ≠ 0.06

Hence, they are not independent.

mework
1.4. P(A ∩ B) = 1/36 [∵ both sum is 6 & the second die shows 5 is 1/36 chance]

a) So, $P(A \cap B) = P(A) \times P(B)$

$\Rightarrow \frac{1}{36} = \frac{5}{36} \times \frac{1}{6}$

$\Rightarrow \frac{1}{36} \neq \frac{5}{216}$ ∴ they are not conditionally independent

b) P(sum is '7' / given first die shows '5')

$\Rightarrow \frac{1}{36}$

So, $P(A \cap B) = P(A) * P(B)$

$\frac{1}{36} = \frac{6}{36} * \frac{1}{6}$

$\Rightarrow \frac{1}{36} = \frac{1}{36}$ ∴ They are conditionally independent.

Homework 1.5

$P(O|T) = P(O|T) / P(T)$
$= 0.3 \times 0.6 = 0.18$

$P(O|NJ) = 0.1$
$P(O \cap NJ) = P(O|NJ) / P(NJ)$
$= 0.1 \times 0.1 = \not{=} 0.01$

$P(O|A) = 1 - 0.6 - 0.1 = \underline{0.3}$

$P(O \cap AR) = P(O|A) / P(A)$
$= 0.3 \times 0.2 = \underline{0.06}$

a) $P(\text{To find oil}) = 0.18 + 0.06 + 0.01$
$= \underline{0.25}$

b) $P(\text{that they drilled in texas}) =$
$P(T \cap O) / P(O)$
$= 0.18 / 0.25 = \underline{0.72}$

Homework 1.6

- $P(\text{passenger did not survive}) = \frac{1490}{2201}$
$= \underline{0.67}$

- $P(\text{passenger was in } 1^{st} \text{ class}) = \frac{325}{2201} = \underline{0.14}$

- $P(\text{passenger survived} \mid 1^{st}\ \text{class}) = \frac{203}{711}$

$= 0.28$

- $P(\text{survived}) = \frac{711}{2201} = 0.323$

$P(1^{st}\ \text{class}) = \frac{325}{2201} = 0.147$

$P(\text{survived} \cap 1^{st}\ \text{class}) = 0.28$

$\Rightarrow P(\text{survived} \cap 1^{st}\ \text{class}) = P(\text{survived}) * P(1^{st}\ \text{class})$

$0.28 \neq 0.04$

Hence, they are not independent.

- $P(\text{survived} \mid \text{child} \mid 1^{st}\ \text{class}) = \frac{6}{711} = 0.084$

- $P(\text{survived} \mid \text{adult}) = \frac{654}{711} = 0.919$

- $P(\text{Survived} \mid \text{First}) = \frac{203}{711} = \underline{0.28}$

$P(\text{Survived} \mid \text{Age}) = 1$

$P(\text{Survived} \mid \text{Age} \mid 1^{st}) = 0.28 \times 1$

$= \underline{0.28}$

$\Rightarrow P(\text{Survived} \mid 1^{st}) = P(\text{Survived} \mid \text{Age}) * P(\text{Survived} \mid \text{Age} \mid 1^{st})$

$0.28 = 1 * 0.28$

$\Rightarrow 0.28 = \underline{0.28}$

Hence, they are independent.