AI110 Assignment 1

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EE22BTECH11220

Question:

10.13.3.25:A coin is tossed 3 times. List the possible outcomes.
Find the probability of getting (i) all heads (ii) at least 2 heads

Solution:

The possible outcomes may be listed as follows:
$$\begin{pmatrix} H,H,T & H,H,H \\ H,T,H & H,T,T \\ T,H,T & T,H,H \\ T,T,H & T,T,T \end{pmatrix}$$

(i).

In order to solve this questions let us take a random variable x to represent the number of heads we get in three coin tosses and to explore all the events let us create a table to display the probabilities for varying values of x.

x	P(x)	Cases
0	$\frac{1}{8}$	$\{T,T,T\}$
1	$\frac{3}{8}$	$\{H,T,T\},\{T,H,T\},\{T,T,H\}$
2	$\frac{3}{8}$	$\{H,H,T\},\{H,T,H\},\{T,H,H\}$
3	$\frac{1}{8}$	$\{H,H,H\}$

The probability of getting all heads is clearly
$\frac{1}{8}$.
Using binomial probability distribution we can say that $P(x) = \binom{n}{x}(P(H))^x(P(T))^{n-x}$.
Substituting n as 3 and x as 0 for the first case we get $P(0) = (\frac{1}{2})^3 = \frac{1}{8}$.

(ii).

The probability of getting at least 2 heads or $P(x) \geq 2$ is equal to $\sum_{x=2}^{n} P(x)$.

Clearly $P(2) + P(3) = \frac{3}{8} + \frac{1}{8} = \frac{4}{8}$

Using binomial probability distribution to confirm probabilites we can say that $P(x) = \binom{n}{x}(P(H))^x(P(T))^{n-x}$.

Substituting n as 3 and x as 2 and n as 3 and x as 3 for the second case we get $P(2) + P(3) = \binom{3}{2}(\frac{1}{2})^2(\frac{1}{2})^1 + (\frac{1}{2})^3 = \frac{1}{2}$.

The probability of getting at least 2 heads is therefore

$$\frac{1}{2}.$$