AI1103:Assignment 2

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and latex-tikz codes from

$$= \frac{2^{n-1}}{2^n}$$

$$= \frac{1}{2}$$

$$= 0.5$$

1 GATE CS 2020 QUESTION 45

For $n > 2$, let $a \in \{0, 1\}^n$ be a non-zero vector. Suppose that x is chosen uniformly at random from $\{0, 1\}^n$. Then, the probability that $\sum_{i=1}^{n} a_i x_i$ is an odd number is _____ ?

2 SOLUTION

Consider

$$a = \begin{bmatrix} a_1 \\ a_2 \\ \vdots \\ a_n \end{bmatrix}$$

Fixed non-zero

$$a_i = 0, 1$$

$$x = \begin{bmatrix} x_1 \\ x_3 \\ \vdots \\ x_n \end{bmatrix}$$

$$x_i = 0, 1$$

$\sum_{i=1}^{n} a_i x_i$ lies between 0 to n

Total number of cases$=2^n$

TABLE 0: Values

$\sum_{i=1}^{n} a_i x_i$	0	1	2	...	n
number	$\binom{n}{0}$	$\binom{n}{1}$	$\binom{n}{2}$	...	$\binom{n}{n}$

$$P\left[\sum_{i=1}^{n} a_i x_i \text{ is odd}\right]$$

$$= \frac{\binom{n}{1} + \binom{n}{3} + \dots}{2^n}$$