AI1103 - Assignment 1

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Download all python codes from

https://github.com/CS20BTECH11004/AI1103/tree/main/Assignment%201/codes

and latex-tikz codes from

https://github.com/CS20BTECH11004/AI1103/blob/main/Assignment%201/Assignment%201.tex

1 Question

In an examination, 20 questions of true-false type are asked. Suppose a student tosses a fair coin to determine his answer to each question. If the coin falls heads, he answers 'true'; if it falls tails, he answers 'false'. Find the probability that he answers at least 12 questions correctly.

2 Solution

Let X be the number of correct answer ($X \in \{0, 1, 2, ..., 20\}$). Let p be the probability of getting the answer correct and q be the probability of getting the answer wrong. $p = q = 0.5$

$$\Pr(X \geq 12) = \sum_{r=12}^{20} {}^{20}\mathrm{C}_r p^r q^{20-r} \tag{2.0.1}$$

$$= {}^{20}\mathrm{C}_{12}\left(\frac{1}{2}\right)^{20} + ... + {}^{20}\mathrm{C}_{20}\left(\frac{1}{2}\right)^{20} \tag{2.0.2}$$

$$= \left(\frac{1}{2}\right)^{20}\left({}^{20}\mathrm{C}_{12} + {}^{20}\mathrm{C}_{13}... + {}^{20}\mathrm{C}_{20}\right) \tag{2.0.3}$$

$$= 0.25172233581 \tag{2.0.4}$$

The following situation can be represented by a binomial distribution where $n = 20$ and $p = 1/2$