Discrete Random Variables; Probability Mass Functions; Expectations

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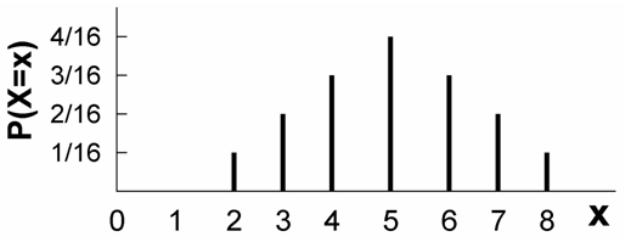
1 Discrete Random Variables

Random variable just a function that give an outcome a variable(value). For example, When you toss a coin, it will have two possibilities: Head and tail. We could assign it a value such as: Head stands for 1, tail stands for 0. We assign this because its very convenient. Instead of writing $P(\textit{toss a coin and then it sets to tail})$, we can write $P(X = 0)$.

2 Probability mass functions (PMF)

This is crucial and often linked with random variable. It's a mathematical function that gives the probability of a discrete random variable taking on a specific value.

x	P(x)
2	1/16
3	2/16
4	3/16
5	4/16
6	3/16
7	2/16
8	1/16



Its formula denoted as:

$$P_x(X) = P(X = x) = P(w \in \ s.t\ X(w) = x)$$

3 Expectations

It's an avarage value after a large nunber of repititions.

$$E[x] = \sum_x xP_n(x)$$

3.1 Variance

How speard out the data between the mean of the avg.
Recall:

$$E[x^2] = \sum_x x^2 P_X(x)$$

$$var(x) = E[(x - E[x])^2]$$

The $(x - E[x])^2$ it's the distance between the data point to the mean. We can rewrite this:

$$var(x) = E[x^2] - (E[x])^2$$