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Variance plays a major role in probability theory and statistics. You can define variance as a scale measuring the degree to which the data of the given data set has been spread out. In probability theory, the variance measures and describes the probability distribution i.e. variance determines about how far the numbers are distributed away from the expected value. Variance gives the statistics of the probability of getting the expected value.

Formula for Variance

In order to calculate variance, you need to apply a formula. The formula for variance is Var(A) = E(A2) - [E(A)] 2 . In this formula, Var(A) refers to variance of variable A and E(A) refers to the expected value of A. The formula for variance remains the same for both probability theory and statistics. In French literature, this formula for variance is called the Konig-Huygens theorem.

How to find Variance in Probability theory?

In probability theory, both actual and theoretical probability distributions have a need to calculate variance. Depending upon the types of probability distribution, the variance has to be calculated on total set of data or based on a sample taken from the whole set.

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Let us consider an example of finding out the probability of occurrence of the head while throwing a coin twice. Will the head occur 1 time or 2 times or is there a probability that the head do not occur at all? The probability of getting only tails while throwing the coin twice is 0.25, the probability of getting head once is 0.5 and the probability of getting 2 heads while throwing the coin twice is 0.25. With this information, let us now calculate variance.

Variance calculation is done by calculating the average of the squared differences of all the numbers in the data set from the expected value.

So, to find variance, the first step is to find the expected value. The expected value for this example is 1 and it is achieved by performing the following calculation:

0.25 x 1 + 0.5 x 1 + 0.25 x 2 = 0 + 0.5+0.5 = 1

As a next step, the difference of the numbers 0, 1 and 2 from the expected value is found out. Then the probabilities have to be multiplied with the squared differences. The equation for variance in this example is demonstrated below:

=> 0.25 x (0-1) 2 +0.5 x (1-1) 2 + 0.25 x (2-1) 2

=> 0.25 x 12 + 0.5 x 02 + 0.25 x 12

=> 0.25 x 1 + 0.5 x 0 + 0.25 x 1

=> 0.25+0+0.25

=> 0.5

Therefore the variance for the above example is 0.5.

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