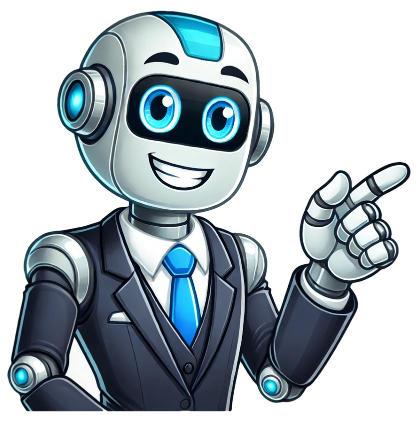

What is the expected value of the distribution

When is a discrete random variable having support and probability mass function , the formula for computing its expected value is a straightforward implementation of the informal definition given above: the expected value of is the weighted average of the values that can take on (the elements of), where each possible value is weighted by its respective probability . Less technically inclined readers can safely skip it, while interested readers can read more about it in the lecture entitled Expected value and the Lebesgue integral. For instance, if you play the game 100 times, win 50 times and lose the remaining 50, then your average winning is equal to the expected value: In general, giving a rigorous definition of expected value requires quite a heavy mathematical apparatus. Solution Since is discrete, its expected value is computed as a sum over the support of : Let be a discrete variable. Its support is Its probability density function is Compute the expected value of . If you are not familiar with the Riemann-Stieltjes integral, make sure you also read the lecture entitled Computing the Riemann-Stieltjes integral: some rules, before reading the next example. We will look at those next! by Marco Taboga, PhD The concept of expected value of a random variable is one of the most important concepts in probability theory. Since a random variable can be discrete (e.g. the number of children in a family) or continuous (e.g. the price of a flight ticket), probability distributions can also be either discrete or continuous. In the above definition of expected value, the order of the sumis not specified, therefore the requirement of absolute summability is introduced in order to ensure that the expected value is well-defined. Suppose, for example, that is a row vector; then Let be a random matrix, that is, a matrix whose entries are random variables. A probability distribution describes how probabilities are distributed across the different values or outcomes of a (random) variable. In the example above, a variance of 3.7 suggests that the data points are somewhat spread out from the mean. . This is an important property. Solution Since is continuous, its expected value can be computed as an integral: Let be a continuous random variable. When is a discrete random vector and is its joint probability function, then When is an continuous random vector and is its joint density function, then If is a random variable and is another random variable such thatwhere and are two constants, then the following holds: Proof For discrete random variables this is proved as follows:For continuous random variables the proof isIn general, the linearity property is a consequence of the transformation theorem and of the fact that the Riemann-Stieltjes integral is a linear operator: A stronger linearity property holds, which involves two (or more) random variables. The expected value of iswhere the integral is a Riemann-Stieltjes integral and the expected value exists and is well-defined only as long as the integral is well-defined. The space of all random variables such that exists and is finite is denoted by or , where the triple makes the dependence on the underlying probability space explicit. The next sections contain more details about the expected value. Step 1: Make a probability chart (see: How to construct a probability distribution). Let its support be Let its probability mass function be Compute the expected value of . "Expected value", Lectures on probability theory and mathematical statistics. Each realization is weighted by its probability. When the absolute integrability condition is not satisfied, we say that the expected value of is not well-defined or that it does not exist. The formula is given as E … What is the expected value of your gain? The formula, which does not require to be discrete or continuous and is applicable to any random variable, involves an integral called Riemann-Stieltjes integral. . For example, if you play a game where you gain 2$ … The expected value may not be exactly equal to a parameter of the probability distribution, but rather it may be a function of the parameters. Let ,,..., be real numbers () such that: Define a new random variable (function of) as follows: As the number of points increases and the points become closer and closer (the maximum distance between two successive points tends to zero), becomes a very good approximation of , until, in the limit, it is indistinguishable from . Probability Mass Function (PMF): associated with discrete variables, the PMF gives the probabilities for individual outcomes, for example, the probability of a family having one child, having two children, and so on. Variance helps in understanding the variability within a dataset. The following table gives the expected value for each of the common discrete distributions we … To find the expected value, E (X), or mean μ of a discrete random variable X, simply multiply each value of the random variable by its probability and add the products. In real-world applications, variance is used in finance to assess risk, in quality control to measure consistency, and in many other fields to analyze variability.Formula for VariancePopulation Variance (σ^2)The formula for the variance of a population is:\sigma^2 = \frac{\sum_{i=1}^{N} (x_i - \mu)^2}{N}Where:σ2 is the population variance.xi represents each data point in the population.μ is the mean of the population.N is the total number of data points in the population.Sample Variance (s^2)The formula for the variance of a sample is:s^2 = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}Where:s2 is the sample variance.xi represents each data point in the sample.\bar{x} is the mean of the sample.n is the total number of data points in the sample.Relationship Between Expected Value and VarianceVariance can also be expressed using the expected value in the following way:Var(X) = E[(X − E(X))2]This formula can be expanded to show the relationship between the expected value and variance more explicitly:Var(X) = E[(X − E(X))2] = E[X2 − 2XE(X) + (E(X))2]Using the linearity of expectation, this becomes:Var(X) = E[X2] − 2E(X)E(X)+(E(X))2 = E[X2] − (E(X))2Therefore, the variance of a random variable X can be calculated as the difference between the expected value of the square of X and the square of the expected value of X:Var(X) = E[X2]−(E(X))2Read More, Image by Author | Ideogram A cornerstone concept in statistics and data analysis is that of probability distributions. Its support is Its probability density function is Compute the expected value of . We report it below without further comments. However, if the terms are absolutely summable, then the order in which you sum becomes irrelevant. Definition (informal) The expected value of a random variable is the weighted average of the values that can take on, where each possible value is weighted by its respective probability. 2. Following a similar notation, the PDF is denoted by F(X)=P[x