

The probability mass function of a random variable. The probability mass function (also known as the PMF or the mass) of a random variable  $X$  just gives the probabilities that  $X$  takes on the values  $x$  all across the real line. In other words, for each real  $x$ , the mass gives the probability  $X = x$ . So we define  $p_X(x) = P(X = x)$ .

The cumulative distribution function of a random variable. The cumulative distribution function (also called the CDF) accumulates the probability for a random variable, sweeping from the left up to the present value. I.e., the CDF gives the probability that  $X$  is less than or equal to  $x$ , for real values  $x$ . In other words, we define the CDF to be  $F_X(x) = P(X \leq x)$ .

For comparison: the mass is

$$p_X(x) = P(X = x)$$

The CDF is

$$F_X(x) = P(X \leq x)$$