

Continuous and Mixed Random Variables

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What is a continuous random variable?

A random variable X is continuous if a cumulative distribution function $F_X(x)$ is continuous for $x \in \mathbb{R}$.

Continuous variables lend themselves to Probability Density Functions (PDFs). A PDF is defined as

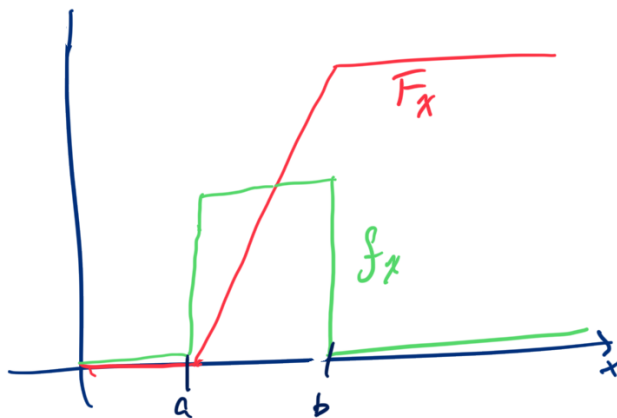
$$f_X(x) = \frac{dF_X(x)}{dx}$$

Consider a uniform distribution of x between $[a, b]$.

$$F_X = \begin{cases} 0, & x < a \\ \frac{x-a}{b-a}, & a \leq x \leq b \\ 1, & x > b \end{cases}$$

then

$$f_X = \begin{cases} 0, & x < a \\ \frac{1}{b-a}, & a \leq x \leq b \\ 0, & x > b \end{cases}$$



Now that we've got some machinery we can define a couple of things:

$$- P(x \in [a, b]) = \int_a^b f_X(x) dx$$