Random Variable Cheat Sheet v1.0

Advanced Statistics

$E[X] = \mu_X = \sum_{i=1}^{n} p(x_i) \cdot x_i$

$E[f(x)] = \sum_{i=1}^{n} p(x_i) \cdot f(x_i)$

$Var[X] = E[(X - \mu_X)^2] = E[X^2] - (\mu_X)^2 = \sigma_x^2 = \sum_{i=1}^{n} p(x_i) \cdot (x_i - \mu_X)^2$

Sum of Random Variables

$E[X + Y] = E[X] + E[Y]$ (expected values add)

when X and Y are independent: $Var[X + Y] = Var[X] + Var[Y]$

more generally: $Var[X + Y] = Var[X] + Var[Y] + 2 \cdot Cov[X, Y]$

where:

$Cov[X, Y] = E[X \cdot Y] - E[X] \cdot [Y]$

$Corr[X, Y] = \frac{Cov[X,Y]}{\sigma_x \cdot \sigma_y}$

Linear Transformations of Random Variables:

If $Y = aX + b$ then $E[Y] = aE[X] + b$ and $Var[Y] = a^2 Var[X]$