Some Common Notations in Statistical Analysis

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Common Notations I

Symbol	**Meaning**
X, Y	Capitalized letters mean random variables
x, y	Small letters mean realizations of random variables
$< \Omega, \mathcal{F}, \mathbb{P} >$	Probability space: $\begin{cases} \Omega \text{ is the set of elementary outcomes} \\ \mathcal{F} \text{ is the set of events} \\ \mathbb{P} \text{ is the probability measure} \end{cases}$
$\mathbb{P}\left\{A\right\}$	Probability of event A
$\mathbb{E}\left[X\right]$	Mathematical expectation of random variable X, also mean of X
$\mathbb{V}\left[X\right]$	Variance of r.v. X, also dispersion of X $\mathbb{V}\left[X\right] = \mathbb{E}\left[\left(X - \mathbb{E}\left[X\right]\right)^2\right] = \sigma_X^2$
σ_X	Standard deviation of r.v. X; $\sigma_X = \sqrt{\mathbb{V}\left[X\right]}$
$cov\left(X, Y\right)$	Covariance coefficient of r.v. X and Y; $cov\left(X, Y\right) = \mathbb{E}\left[\left(X - \mathbb{E}\left[X\right]\right)\left(Y - \mathbb{E}\left[Y\right]\right)\right]$
ρ_{XY}	Correlation coefficient of r.v. X, Y: $\rho_{XY} = \frac{cov(X,Y)}{\sigma_X \sigma_Y}$

Common Notations II

Symbol	Meaning
$\mu_X^k, k = 1, 2, \ldots$	Moment of r.v. X of order k $\mu_X^k = \mathbb{E}\left[X^k\right]$; $\mu_X = \mu_X^1 = \mathbb{E}\left[X\right]$
$\mu_{0,X}^k, k = 1, 2, \ldots$	Central moment of r.v. X of order k $\mu_{0,X}^k = \mathbb{E}\left[\left(X - \mathbb{E}\left[X\right]\right)^k\right]$; $\mu_{0,X}^2 = \mathbb{V}\left[X\right]$
$\mu_{0,X,Y}^2 = \mu_{X,Y}$	Mixed moment of r.v. X, Y $\mu_{X,Y} = cov\left(X, Y\right)$
$\frac{1}{n}\sum_{i=1}^{n} X_i$	Estimator for $\mathbb{E}\left[X\right]$, using sample $X_1, X_2, \ldots, X_n$
$\frac{1}{n}\sum_{i=1}^{n} x_i$	Estimate for $\mathbb{E}\left[X\right]$, using sample of realizations $x_1, x_2, \ldots, x_n$
$F\left(x\right) = \mathbb{P}\left\{X \leq x\right\}$	Cimulative distribution funtion
$p\left(x_i\right) = \mathbb{P}\left\{X = x_i\right\}$	Probability distribution function (for discrete r.v.)
$f\left(x\right)$	Distribution density function (for continuous r.v.)