1 Algebra

Absolute Value Inequalities

$|f(x)| < a \Rightarrow -a < f(x) < a$.

$|f(x)| > a \Rightarrow f(x) > a$ or $f(x) < -a$

2 Important probability distributions

Bernoulli

Exponential

Gaussian

Poisson

Uniform

3 Expectation and Variance

Expectation

Variance

Covariance

Variance and expectation of mean of n iid random variables

Let $X_1, ..., X_n \overset{iid}{\sim} P_\mu$, where $E(X_i) = \mu$ and $Var(X_i) = \sigma^2$ for all $i = 1, 2, ..., n$ and $\overline{X} = \frac{1}{n}\sum_{i=1}^{n} X_i$.

Variance of the Mean:

$$Var(\overline{X}) = (\frac{\sigma^2}{n})^2 Var(X_1 + X_2, ..., X_n) = \frac{\sigma^2}{n}.$$

Expectation of the mean:

$$E[\overline{X}] = \frac{1}{n} E[X_1 + X_2, ..., X_n] = \mu.$$

4 Law of large Numbers

5 Central Limit theorem

6 Statistical models

7 Confidence intervals

Onesided

Twosided

Delta Method

8 Hypothesis tests

Onesided

Twosided

P-Value