ME10305 - Mathematics

Statistics Formulae

UNIVERSITY OF BATH
MECHANICAL ENGINEERING

Continuous distribution

mean: $\mu = \frac{\sum_{i=1}^{N} x_i}{N}$

variance: $\sigma^2 = \frac{\sum_{i=1}^{N} (x_i - \mu)^2}{N}$

sample mean: $\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$

sample variance: $s^2 = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}$

Discrete distribution

mean: $\mu = \sum_{i=1}^{n} x_i f(x_i)$

variance: $\sigma^2 = \sum_{i=1}^{n} (x_i - \mu)^2 f(x_i)$

Correlation

correlation coefficient: $r = \frac{S_{xy}}{\sqrt{S_{xx} S_{yy}}}$ where: $S_{ab} = \sum_{i=1}^{n} (a_i - \bar{a})(b_i - \bar{b})$

Normal distribution

standard normal variable: $Z = \frac{X - \mu}{\sigma}$ standard error of the mean: $\hat{\sigma}_{\bar{x}} = \frac{s}{\sqrt{n}}$

Hypothesis testing

Test statistics

normal distribution: $Z_0 = \frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}}$

Student's t-distribution: $t_0 = \frac{\bar{x} - \mu}{SE}$

standard errors: $s_p^2 = \frac{SS_1 + SS_2}{\nu_1 + \nu_2}$

$s_p = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$

$SE = \frac{s}{\sqrt{n}}$

$SE = \sqrt{\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}}$