Formula Sheets – post-Test 2 material – STAT 515

Test statistic (hypothesis test about μ):

\[ t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} \]

test statistic for μ<sub>D</sub> in paired-sample t-test: Same as above but with $\bar{D}$ and $s_D$.

Test statistic (hypothesis test about p):

\[ z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} \]

CI for $\mu_1 - \mu_2$:

\[ (\bar{x}_1 - \bar{x}_2) \pm t_{\alpha/2} \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} \]

Test statistic (comparing two means, independent samples):

\[ t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \]

CI for $p_1 - p_2$:

\[ (\hat{p}_1 - \hat{p}_2) \pm z_{\alpha/2} \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}} \]

Test statistic (comparing two proportions):

\[ z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1-\hat{p})(\frac{1}{n_1} + \frac{1}{n_2})}} \]

where $\hat{p}$ is the pooled sample proportion.

ANOVA table formulas:

\[ MST = \frac{SST}{(p-1)}, \ MSE = \frac{SSE}{(n-p)}, \ F = \frac{MST}{MSE} \]

Regression and correlation formulas:

\[ \beta_1 = \frac{SS_{xy}}{SS_{xx}}, \ \beta_0 = \bar{Y} - \beta_1 \bar{X}, \ s = \sqrt{MSE} = \sqrt{\frac{SSE}{(n-2)}}, \]

\[ r = \frac{SS_{xy}}{\sqrt{SS_{xx}SS_{yy}}}, \ r^2 = 1 - \frac{SSE}{SS_{yy}} \]
Test statistic for test of model usefulness:

\[ t = \frac{\hat{\beta}_1}{s/\sqrt{SS_{xx}}} \]

CI for \( \beta_1 \):

\[ \hat{\beta}_1 \pm t_{\alpha/2}(s/\sqrt{SS_{xx}}) \]

CI for \( E(Y) \) at \( x = x_p \):

\[ \hat{Y} \pm t_{\alpha/2}(s)\sqrt{1/n + (x_p - \bar{x})^2/SS_{xx}} \]

PI for new \( Y \) at \( x = x_p \):

\[ \hat{Y} \pm t_{\alpha/2}(s)\sqrt{1 + 1/n + (x_p - \bar{x})^2/SS_{xx}} \]

Test statistic, Test for Multinomial Probabilities:

\[ \chi^2 = \sum \frac{[n_i - E(n_i)]^2}{E(n_i)} \]

where \( E(n_i) = np_i \) is the expected cell count if \( H_0 \) is true.

Test statistic, Test for Independence:

\[ \chi^2 = \sum \frac{[n_{ij} - \hat{E}(n_{ij})]^2}{\hat{E}(n_{ij})} \]

where \( \hat{E}(n_{ij}) = r_i c_j / n \) is the expected count in cell \((i, j)\) under independence.