Formula Sheets – post-Test 2 material – STAT 515

Test statistic (hypothesis test about μ_D in paired-sample t-test):

$$t = \frac{\bar{x}_D - \mu_0}{s_D/\sqrt{n}}$$

CI for $\mu_1 - \mu_2$, if $\sigma_1^2 \neq \sigma_2^2$:

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

CI for $\mu_1 - \mu_2$, if $\sigma_1^2 = \sigma_2^2$:

$$(\bar{x}_1 - \bar{x}_2) \pm t_{\alpha/2}\sqrt{\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}}$$

where

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

Test statistic (comparing two means, independent samples), if $\sigma_1^2 \neq \sigma_2^2$:

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

Test statistic (comparing two means, independent samples), if $\sigma_1^2 = \sigma_2^2$:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}}}$$

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:

$$MST = SST/(k-1),\ MSE = SSE/(n-k),\ F = MST/MSE$$

Regression and correlation formulas:

$$\hat{\beta}_1 = SS_{xy}/SS_{xx},\ \hat{\beta}_0 = \bar{Y} - \hat{\beta}_1\bar{X},\ s = \sqrt{MSE} = \sqrt{SSE/(n-2)},$$

$$r = \frac{SS_{xy}}{\sqrt{SS_{xx}SS_{yy}}},\ r^2 = 1 - SSE/SS_{yy}$$

Test statistic for test of model usefulness:

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

CI for β_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 $\hat{E}(n_{ij}) = R_iC_j/n$ is the expected count in cell (i,j) under independence.