Stat 556:

Homework from the textbook by E.L.Lehmann

Assignment 1 Due Sep 8 in class

Chapter1:

P38 2.10 (for (iii) please attach your R code, Let α=.5, 1, 2 and λ=4, 20, 100, 500, 1000, 10000.)

P40 3.6 (i) (ii), 4.4

P43 5.6

Assignment 2 Due Sep 24 in class

Chapter2:

P119 1.7 (i)(ii)and (iii)

P121 2.10

P123 3.9

P125 4.6 and 4.7 (i), (ii) only do simulation for the U(-1,1) distribution

P127 5.5

Assignment 3 Due October 1 in class

Chapter2:

P130 7.11 (part (i), also assume that the sample correlation of (u_i, v_i) is bounded away from -1)

Assignment 4 Due October 15 in class

Chapter3:

P203 1.8 P210 3.19 (i, ii, iv) P211 4.5, 4.6

Assignment 5 Due Nov 5 in class

Chapter 3: P215 5.4

Chapter 4: P271 2.6, P274 3.7

Chapter 5: P359 4.9

Recommended Chap 5, 1.1, 1.2 and 1.9

Assignment 6 Due Nov 19 in class

Chapter 5: P360 5.7

P361 6.3, 7.3 (i)

Chapter 7 P552 1.12

P361 6.7 Under the hypothesis that $p_{B|A} = p_{B|\bar{A}}$, show that $Var(X/m - Y/n) = Npq/mn$, p can be estimated by $(X+Y)/(m+n)$. The test obtained from (5.6.31) by replacing its denominator by $\sqrt{\frac{N}{mn}\frac{X+Y}{m+n}(1-\frac{X+Y}{m+n})}$ agrees with (5.6.28).

Assignment 7 Due Dec 3 in class

Chapter 7: (1)P554 2.5 (ignore the hint for (iii))

(2) In Example 7.3.3, check that the conditions of Theorem 7.3.1 and Corollary 7.1.1 are satisfied.

(3) P559 5.1

(4) Consider the one-way random effects model with

$$Y_{ij} = \beta + v_i + \epsilon_{ij}$$

for $i = 1, 2, \cdots, n$ and $j = 1, \cdots, k$ (k is fixed), where $v_i \sim N(0, \sigma_v^2)$, $\epsilon_{ij} \sim N(0, \sigma^2)$, and all v_i and ϵ_{ij} are independent. Let $\mathbf{Y}_i = (Y_{i1}, \cdots, Y_{ik})'$. Then $\mathbf{Y}_1$, $\mathbf{Y}_2$, $\cdots$, $\mathbf{Y}_n$ are iid $N(\mathbf{u}, \mathbf{\Sigma})$.

(a) Give $\mathbf{u}, \mathbf{\Sigma}$, and $\mathbf{\Sigma}^{-1}$ explicitly.

(b) Suppose the parameters of interest are $\boldsymbol{\theta} = (\beta, \sigma^2, \sigma_v^2)'$. What is the parameter space Θ?

(c) What is $L(\theta)$?

(d) Find the MLE $\hat{\theta}$ of θ.

(e) Show that $\sqrt{n}(\hat{\boldsymbol{\theta}} - \boldsymbol{\theta}) \rightarrow_L N_3(\mathbf{0}, \mathbf{V})$ and give $\mathbf{V}$ explicitly.

(f) Now suppose we wish to estimate $\boldsymbol{\eta} = (\beta, \sigma^2, \gamma)'$, where $\gamma = \sigma_v^2/\sigma^2$. Use the delta method to find the limiting distribution of $\sqrt{n}(\hat{\boldsymbol{\eta}} - \boldsymbol{\eta})$.