STAT 440, Homework 4

due 2.24.2015

1 Turn-in on paper

1. Plot the empirical power curve for the t-test in Example 6.9, changing the alternative hypothesis to $H_1 : \mu \neq 500$. Do this for $\alpha = 0.01, 0.05, 0.1$ on three different plots.

2. Plot the power curves for the t-test in Example 6.9 for sample sizes 10,20, 30, 40 and 50, but omit the standard error bars. Plot the curves on the same graph, each in a different color or different line type, and include a legend. Comment on the relation between power and sample size.

3. Suppose that you are sampling from an exponential distribution with mean $\theta = 2$ with $n = 15$ observations. You would like to construct a 95% confidence interval for θ. You use the following formula

$$\overline{X} \pm c\sqrt{S^2/n}$$

If your data were normal, c would be taken from a t-table with $df = 14$. However, your data is exponential, not normal. Use monte carlo to find an approximate value for c.

2 Turn-in through Angel

1. Write a function that will estimate the MSE of the level k trimmed means for random samples of size 20 generated from a standard Cauchy distribution. (See the beginning of chapter 6.) The target parameter θ is the center or median of the distribution. Summarize the estimates of MSE in a vector for $k = 1, 2, ..., 9$. This is what your function should return.

2. Write a function that will calculate the coverage probability for a 95% symmetric t-interval to estimate a mean when the data is chi-squared with two degrees of freedom. Your function should take as an argument the size of the sample, n, and the number of monte carlo replicates, m. It should return the coverage probability.