STAT 5113: Statistical Inference

Homework 3 – Due February 16, 2018

A. **One or more of the following problems *might* be graded.**

1. Find Fisher information for a sample from a $\mathcal{G}am(\alpha, \beta)$ distribution, and use it to determine the asymptotic distribution of the ML estimator of the unknown 2-dimensional parameter (α, β).
2. Find Fisher information for a Binomial distribution with probability parameter $p \in (0, 1)$

B. **The following problem *will* be graded.**

3. A certain alloy contains a small proportion of zinc. Due to the production process, the actual zinc content varies slightly from batch to bach. For a randomly selected batch, the proportion of zinc can be modeled as a random variable having the following distribution:

$$f(x; \theta) = \theta(1 - x)^{\theta - 1} \qquad 0 < x < 1,$$

where θ is a positive parameter.

Eighteen randomly selected batches of the alloy were analyzed and the zinc content, in percentage, was found to be the following.

1.2	2.7	5.2	0.9	4.8	4.0	4.2	0.8	1.6
1.0	1.6	5.1	4.6	2.7	1.2	1.8	4.8	1.9

a. Estimate the value of the parameter θ, providing also an estimate of the asymptotic standard error of the estimator.

b. Estimate the average zinc content of the alloy, providing also an estimate of the asymptotic standard error of the estimator.