ECSE 6520: Detection and Estimation Theory

Homework 2

Due February 13th, 2014

1. Prove that if T_{min} is a minimal sufficient statistics and h is an invertible function, then $h(T_{min})$ is also a minimal sufficient statistics.

2. Let T be a sufficient statistics distributed as $T \sim \mathcal{B}(2, \theta)$ where $\mathcal{B}(2, \theta)$ denotes the binomial distribution with parameters n (number of trials) and θ (probability of success). Show that T is a complete sufficient statistics.

3. Show that each of the following statistics is not complete, by finding a non-zero function ϕ such that $E[\phi(T)] = 0$.

   a. T is uniformly distributed between $-\theta$ and θ.

   b. $T \sim \mathcal{N}(0, \theta)$.

4. Express the following pdfs or pmfs as members of the exponential family of distributions and determine the minimal sufficient statistics. For each item assume N i.i.d. random variables.

   a. Exponential pdf.

   b. Rayleigh pdf.

   c. Multinomial pmf.

   d. Geometric pmf.